DEVOTED TO
TEXTILE CHEMISTRY
AND
WET-PROCESSING
BLEACHING
DYEING
PRINTING
FINISHING

FEBRUARY 7, 1949
VOLUME 38, No. 3

AMERICAN DYESTUFF REPORTER

OFFICIAL PUBLICATION
of the
PROCEEDINGS
AMERICAN ASSOCIATION
OF TEXTILE CHEMISTS
AND COLORISTS

"Cuprophenyl" means . . .

that new series of Geigy Direct dyestuffs possessing good resistance to washing, water bleeding, salt water, dry cleaning, wet cleaning and light, with light fastness and shade being unaffected and in most instances improved by any of the popular anti-crease finishes.

The Cuprophenyl(*) colors dye cotton and viscose rayons like any ordinary direct color but are aftertreated with copper sulphate and acetic acid.

Two outstanding Cuprophenyl colors deserving your immediate consideration are

Cuprophenyl Navy Blue R L (†)
Cuprophenyl Navy Blue B L (†)

described in Bulletins 4 G and 5 G.

(*) *Registered U. S. Patent Office.*
(†) *Patented.*

GEIGY COMPANY, INC.

89-91 BARCLAY STREET — NEW YORK — NEW YORK

Boston · Philadelphia
Charlotte, N. C. · Portland, Ore.
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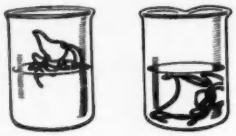
Geigy
Dyestuff Makers Since 1859

In Great Britain
The Geigy Co., Ltd.
National Buildings
Parsonage, Manchester



OTHER BENEFITS in textile operations, such as faster wetting, penetrating and dispersing, can be achieved with DECERESOL* Wetting Agents.

THE QUALITY OF MANY FABRICS is determined to a great extent by the quality of the sulfonated oils used in their manufacture. Cyanamid's Sulfonated Oils have stood the test of time because of their consistent high quality and dependability.

DOUBLE BENEFITS WITH PARAMUL 115 WATER REPELLENT

Water repellency *plus* superior resistance to water borne stain are both obtained through the use of Cyanamid's PARAMUL* 115 Water Repellent in a wide variety of fabrics—cottons, rayons, linens and woolens — for outerwear and equipment purposes.

PARAMUL 115 is but one of a number of Cyanamid Textile Specialties carefully formulated to perform specific tasks with the utmost efficiency and economy.

We offer you the facilities of our textile research laboratories and the cooperation of our technical staff in using these specialties to obtain the most satisfactory results.

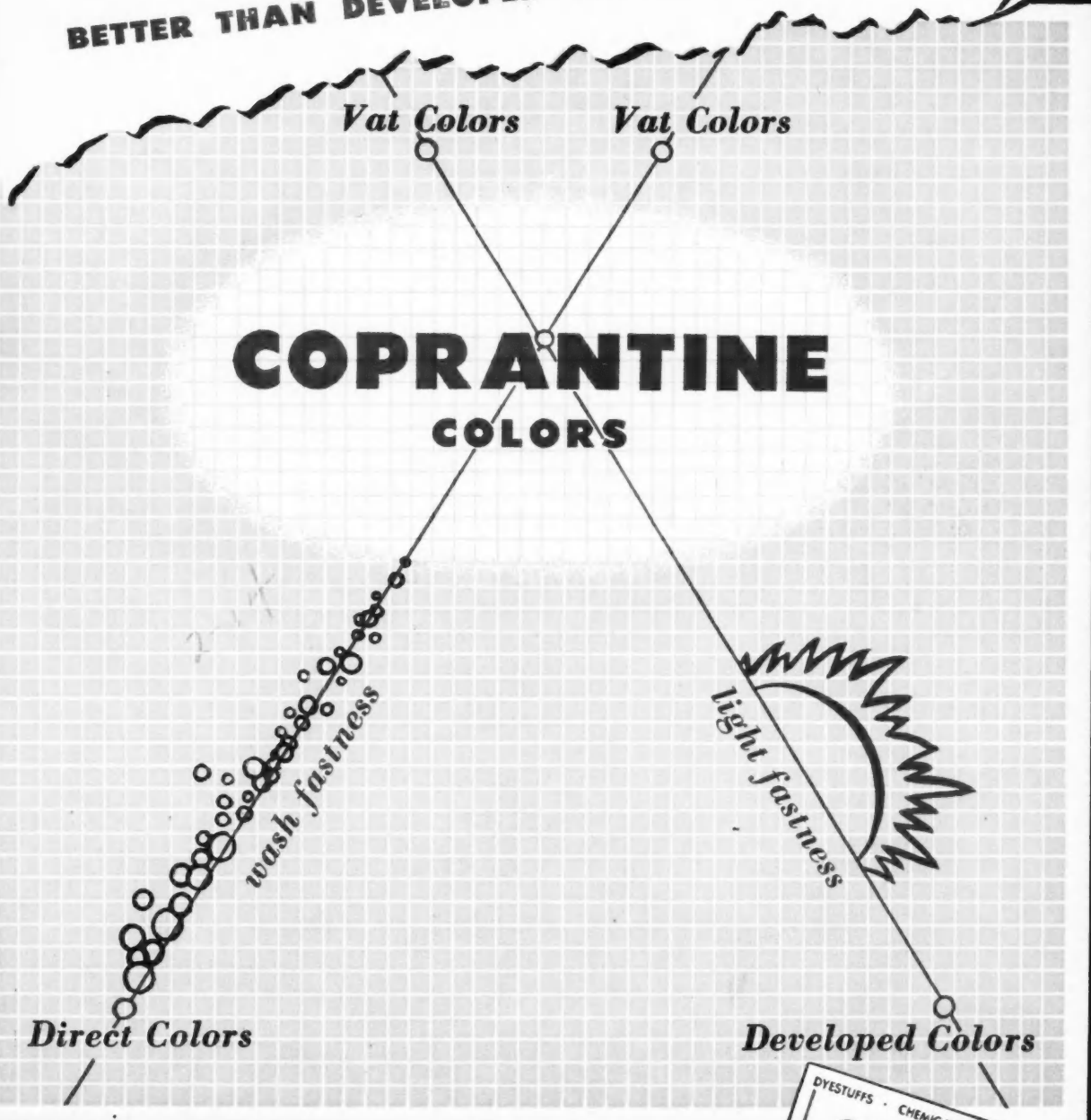
Our descriptive booklet "Textile Specialties" will be mailed at your request.

*Reg. U. S. Pat. Off.

AMERICAN Cyanamid COMPANY
INDUSTRIAL CHEMICALS DIVISION, DEPT. E
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

American Dyestuff Reporter, Vol. 38, No. 3. February 7, 1949. Published every other Monday. Copyright 1949, by Howes Publishing Co., Inc., One Madison Ave., New York 10, N. Y. Domestic subscription, $5.00; Canadian, $6.00. Foreign, $10.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879.

IF YOU NEED
BETTER THAN DIRECT COLOR WASH FASTNESS
AND
BETTER THAN DEVELOPED COLOR LIGHT FASTNESS



COPRANTINE colors
are applicable to:

- **VISCOSE RAYON**
- **COTTON**
- **ACETATE BLENDS**
- **WOOL BLENDS**

IN YARNS, HOSIERY, KNIT GOODS AND WOVEN FABRICS ... in all instances where the fastness requirements demand better than direct or developed color fastness

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VAT DYES OF THE DOW CHEMICAL CO.

FINISHING TEXTILES

VANDERBILT *finds the way!*

For UNIFORMITY in talc—**NYTAL**

OUR NEW MODERN TALC PLANT

BUILT TO PRODUCE AN IMPROVED PRODUCT

R. T. VANDERBILT CO. INC.

230 Park Avenue, New York 17, N. Y.

Carefully Controlled Chlorine Content in HOOKER SULFUR CHLORIDES

Where it is not feasible to use elemental chlorine in your processes, Hooker Sulfur Chlorides, mono and di, provide chlorine in convenient to use form. You can always be sure, too of a carefully controlled chlorine content.

Hooker Sulfur Monochloride contains a minimum of 50% chlorine, and Hooker Sulfur Dichloride has a minimum of 66% chlorine.

Other Hooker Chlorinating agents are sulfuryl chloride, thionyl chloride, hydrogen chloride, phosgene and chlorine. Bulletin 328A—"Chlorinating Agents" gives more detailed information on these chlorinating chemicals. Technical Data Sheets on each describe in detail the physical and chemical properties. Copies of this bulletin or individual Technical Data Sheets are available when requested on your business letterhead.

Hooker Technical Staff is also ready to help you with your specific problems involving Hooker Chemicals.

HOOKER RESEARCH PRESENTS
SODIUM CHLOROACETATE
$Cl \cdot CH_2 \cdot COONa$

Molecular Weight 116.49
Melting Point ..... Decomposes at about 200°C before reaching a melting point

Hooker Sodium Chloroacetate, a new development of the Hooker Research Laboratories is a white, odorless non-hygroscopic, free-flowing powder. On standing open to atmosphere, it loses its moisture over a period of 3 to 4 days, after which no further loss in weight occurs. It is ground and sieved through No. 10 mesh screen. It is completely and quickly soluble in water, slightly soluble in methanol, insoluble in acetone, benzene, ether and carbon tetrachloride.

For monchloroacetic acid reactions which require the replacement of the chlorine atom under alkaline or neutral conditions, the use of Sodium Chloroacetate removes the necessity of this step by providing the salt for the reaction. It is much more convenient and safer to handle than the acid. It eliminates hydrolysis losses from heat of neutralization and consequent diminished yield of product.

Hooker Sodium Chloroacetate is at present available in pilot plant quantities. Technical Data Sheet No. 375 gives physical and chemical characteristics and typical analysis. When requesting samples or literature, please write on your business letterhead.

SULFUR DICHLORIDE SCl_2

Molecular Weight	103
Description	Brownish red liquid
Freezing Point	−78°C
Boiling Point	Decomposes above 40°C
Specific Gravity at 15.5°C	1.638
Analysis	Minimum chlorine by wt. 66%

USES

Sulfur Dichloride is a chlorine carrier; used as a special chlorinating agent and as a chloridizing agent in metallurgy; as a reagent in the manufacture of organic acid anhydrides and other organic chemicals, in manufacture of insecticides, rubber cements, rubber substitutes; in the treatment of drying oils for special use in varnishes; in general as a replacement for sulfur monochloride in processes where a higher chlorine content is desired.

SULFUR MONOCHLORIDE S_2Cl_2

Molecular Weight	135
Description	Yellow to slightly reddish liquid
Freezing Point	−80°C
Boiling Point	138°C
Specific Gravity at 15.5°C	1.690
Analysis	Minimum chlorine by wt. 50%

USES

Sulfur Monochloride is used in the manufacture of organic chemicals, rubber substitutes; an agent for cold vulcanization of rubber products; a polymerization catalyst; reagent in manufacture of insecticides, chemical intermediates, phenolic resins, and other diversified chemicals; solvent for sulfur.

From the Salt of the Earth

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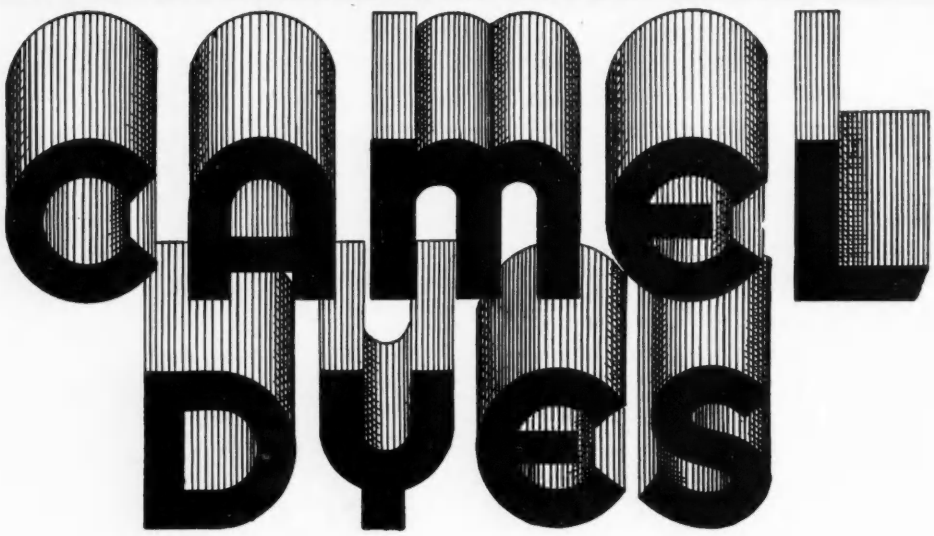

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DEPENDABLE DYESTUFFS
has served the textile mills of America without interruption since 1876.

This broad experience assures
PROMPT • EFFICIENT • ECONOMICAL SERVICE
TO MEET ALL DYESTUFF REQUIREMENTS

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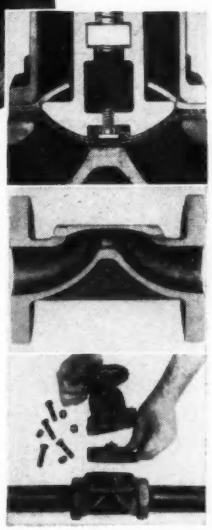
Simple as pinching a rubber tube

A GRINNELL-SAUNDERS DIAPHRAGM VALVE works on a simple principle . . . it pinches tight for positive closure and opens wide for streamlined flow. The working parts of the valve are completely isolated from the fluid . . . no corrosion, no contamination and no leaks. Choice of diaphragm material. Body materials . . . cast iron, malleable iron, bronze, aluminum, stainless steel. Body linings . . . glass, lead, rubber or synthetics.



NO METAL-TO-METAL SEAT . . . The large contact area on which this flexible diaphragm seats gives positive closure even when grit, scale or other solid matter is temporarily trapped.

MINIMUM RESISTANCE TO FLOW . . . Smooth streamlined fluid passage without pockets prevents accumulation of sludge and reduces friction resistance to a minimum.

MAINTENANCE REDUCED . . . The diaphragm is the only part that normally wears out. Replaced in a few minutes without removing valve from line.

Available in various combinations of valve bodies and operating mechanisms.

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Shown here is one view in the spotless modern plant where Swift's Animal Protein Colloid is made. Operation is continuous, automatic . . . the product is "untouched by human hands," not contaminated by foreign substances.

Investigate this Modern Process Agent:

Swift's Animal Protein Colloid*

(made from an exclusive Swift Process)

Does your manufacturing process require . . .

1. An emulsifier?
2. A flotation agent?
3. A gel structure?
4. A settling agent?
5. A protective coating?
6. A sizing agent?
7. A carrier of pigments?
8. An impregnating agent?
9. A base for pigment?
10. An oilproofing agent?
11. A flocculating agent?
12. A clarifying agent?
13. A filtering agent?
14. A stiffening agent?
15. A mordant?

This modern process agent, Swift's refined Animal Protein Colloid, has properties which may be employed in a wide number of processes. Even though you have used other processing agents, be sure you investigate Swift's Animal Protein Colloid now. It has unusual properties. It may meet the requirements of your present operations or help in developing new ones.

**Commercially high quality bone glue.*

What is this modern process agent?

Swift's Animal Protein Colloid is made by an exclusive Swift process. Protein liquor is extracted from bones and highly concentrated. This pure liquid falls on a bed of dry finished product which adheres evenly to the droplets. Then, by continuous and automatic schedule, these droplets travel through driers and are milled and screened. This whole operation is under *precise synchronized control* and is completed in relatively short time.

The result is a uniform granular form that goes into solution rapidly. It's a purified product, light amber in color.

Because plant and machinery are kept spotlessly clean — the finished product does not touch material which can contaminate it with foreign substances . . . because of the precise control possible with Swift's exclusive process, Swift can bring you this *superior* processing agent. And Swift's Animal Protein Colloid has the same high quality and uniform characteristics the year 'round.

Swift's technical service yours, investigate now

Write or phone for one of Swift's special representatives. He will call and discuss Swift's Animal Protein Colloid with you. This process agent may be just what you are looking for. Write to:

Swift & Company

ADHESIVE PRODUCTS DEPARTMENT

4127 Packers Avenue, Chicago 9, Illinois

CHROMAVEN* WOOL COLORS
provide the answer to the demand for better color fastness in textiles

Chromaven Dyes offer the wool-dyer maximum fastness to sunlight, perspiration, sea-water, carbonizing, washing, dry-cleaning.

Chromaven colors meet all fastness requirements and shade demands... for every kind of wool-dyeing.

Another American Aniline achievement in effective color fastness.

Detailed information regarding your own particular wool-dyeing requirements will be furnished upon request to our nearest branch.

Experienced A.A.P. technicians are always happy to be of service.

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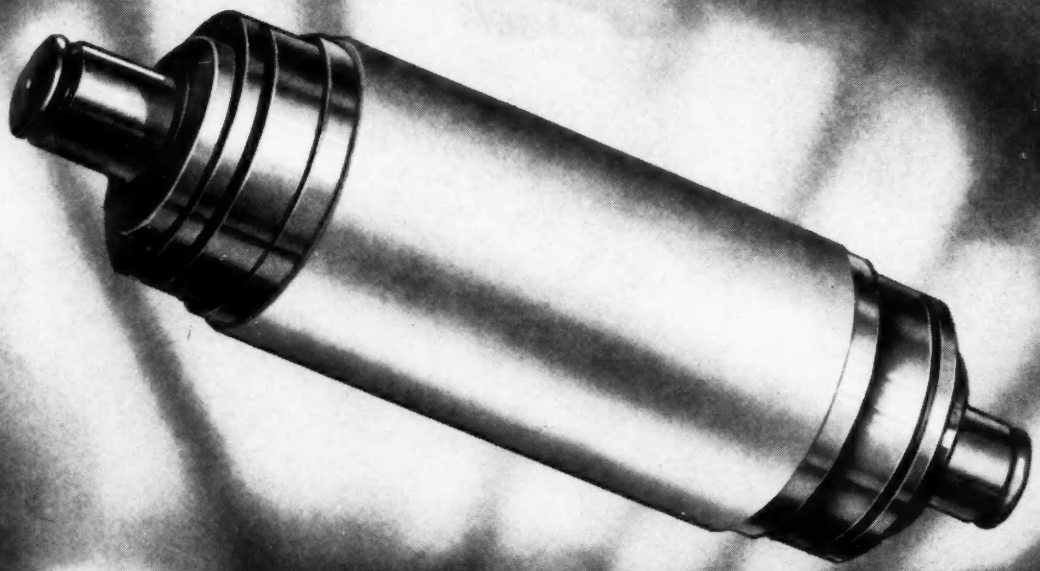
PERKINS



Perkins Calender Rolls—the natural result of the longest and broadest experience in the industry give a quality that is definitely reflected in your product. Perkins service includes refills of any make of calender rolls.

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- The ideal penetrant with outstanding rewetability, increased softening power.
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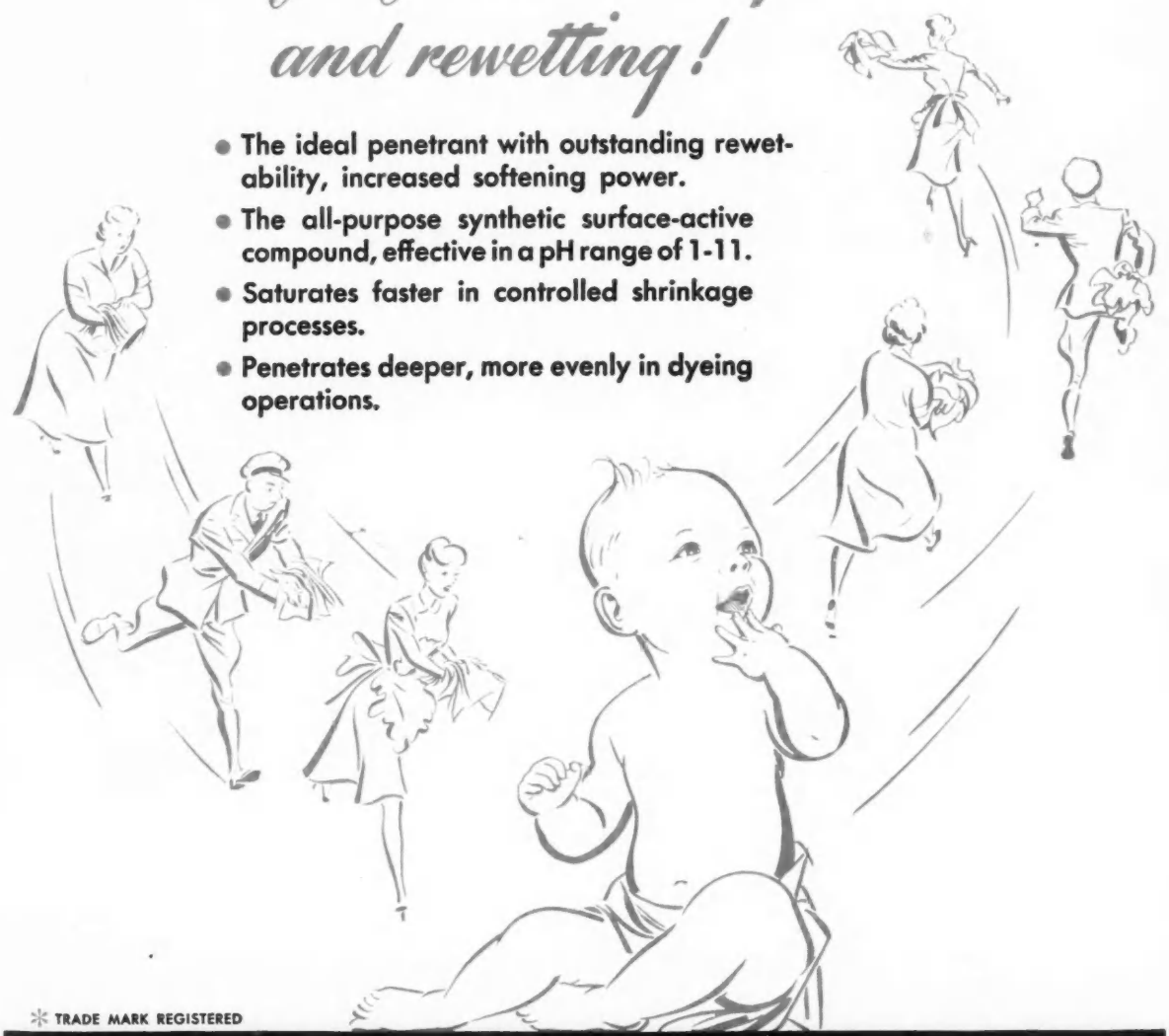
- Saturates faster in controlled shrinkage processes.
- Penetrates deeper, more evenly in dyeing operations.



* TRADE MARK REGISTERED

ARNOLD, HOFFMAN & CO., INCORPORATED

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ESTABLISHED 1815 — PLANTS AT DIGHTON, MASS., CHARLOTTE, N. C. AND CINCINNATI, OHIO

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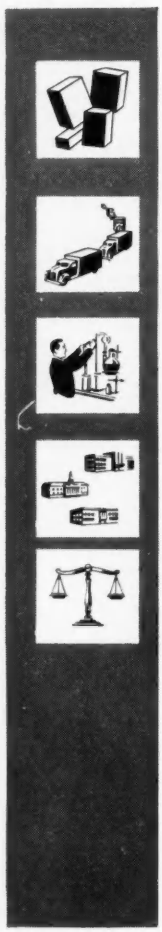
MR. BUYER!

LET'S START '49 WITH THIS SIGN?



Do you know another manufacturer in New England that can offer you a complete line of products for your finishing and dyeing departments — such as chip soaps, solid soaps, cold scour soaps, synthetics, tar removers, detergents, Calex crystals, penetrants (both dyehouse and carbonizer), formaldehyde, stripping agents, etc.?

Do you know another manufacturer in New England that can offer you practically overnight deliveries to your mill with their own fleet of trucks, driven by their own courteous drivers?

Do you know another manufacturer in New England that has a trained and experienced staff of technical representatives capable of talking over your troubles, even to the extent of taking off their hats and coats and going to work in your mill, if necessary?

Do you know another manufacturer in New England that, in addition, backs up these men with three separate laboratories (Research, Analytical and Plant Control), directed by men with long experience?

Do you know another manufacturer in New England that can offer you all these advantages and still maintain a price structure which is equal to, and in many cases, lower than competition?

We feel you'd like to know these facts. If you weigh them, give them full consideration, we're sure you'll start '49 with the Watson-Park line. All inquiries will receive our prompt and complete attention.

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FACTORY · LOWELL JUNCTION MASS.

Established 1925

FOR 1949

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IMPORTANT TO TEXTILE PROCESSING

FORMALDEHYDE

Formaldehyde Solution U.S.P. A clear, colorless liquid of the highest purity. For water repellents, glazes, resins, anti-mildew agents. For crease-proofing and crush-proofing. Shipped in tank cars, drums, carboys, bottles, tank trucks (N.Y. metropolitan area only).

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Available in a wide variety of compounds for use as solvents and intermediates in dye manufacture.

FORMIC ACID

For dyeing of acid colors; wool treatment for moth-proofing; emulsions for impregnating fabrics; as a sour to prevent yellowing; acid wash after sulfur coloring and dyeing. Shipped in 125 lb. carboys.

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U.S.P. and Technical Grades. For the preparation of water repellents; production of fast prints on textiles. Shipped in 200 lb. bbls.; 100, 50 and 25 lb. fiber drums.

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- . . . Constant source of supply.
- . . . Production control through uniformity.
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- . . . Extensive facilities of 5 modern plants.

Technical literature, samples and prices forwarded promptly upon request on company letterhead.

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Paraformaldehyde · Parahydroxybenzoates · Penicillin · Pentaerythritols · Salicylates · Salicylic Acid · Streptomycin

No matter how often she washes her nylons, if they're ETERNALURE-treated they'll have the same attractive finish that made her buy them in the first place. The Eternalure finish lasts for the life of the hose. It gives better snag resistance, too, along with a smoother fit and a satisfying "feel."

These user-benefits help sell nylons. But ETERNALURE helps you produce them at lower cost. Stitch is well clarified . . . properly tightened. Hose are easier to handle with fewer seconds due to pull threads. The finish is even with no chalky deposits.

ETERNALURE

RESIN FINISH FOR NYLONS

Eternalure offers you a double-barreled advantage: better selling nylons at lower over-all production costs. And it involves no changes in operations or equipment.

Why not give Eternalure a mill-scale tryout, followed by a complete breakdown in the finishing department?

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PANY

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Johns, Que.

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3 new glycols

BUTANEDIOL-1,3
2-METHYLPENTANEDIOL-2,4
OCTYLENE GLYCOL

useful as:

Intermediates, Coupling Agents
Plasticizers and Softeners
Solvents, Humectants

FOR COMMERCIAL APPLICATIONS

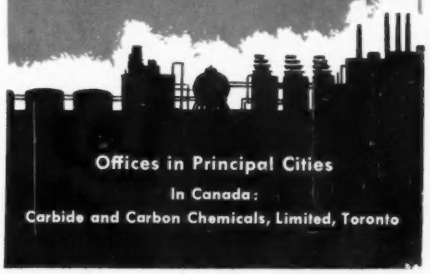
■ Butanediol, Methylpentanediol, and Octylene Glycol are available in tank cars. They are mild-odored, colorless liquids, with low volatility. Butanediol (butylene glycol) is an excellent humectant which is approximately 60 per cent as hygroscopic as glycerol. Methylpentanediol is a versatile mutual solvent. Octylene glycol is the first commercial glycol that is not completely water-miscible, —suggesting its use in the synthesis of plasticizers.

Write or call our nearest office for further information—

Users of glycols and glycerol! Investigate these "Carbide" glycols.

	Molecular Weight	Boiling Pt., °C. at 760 mm. Hg	Viscosity at 20°C., Centipoises	Solubility, % by Wt. at 20°C. In H_2O	H_2O In
BUTANEDIOL-1,3	90	207.5	110	Complete	
2-METHYLPENTANEDIOL-2,4	118	197.1	34	Complete	
OCTYLENE GLYCOL	146	244.2	323	4.2	11.7
Ethylene Glycol	62	197.2	21	Complete	
Diethylene Glycol	106	245.0	36	Complete	
Triethylene Glycol	150	287.4	48	Complete	
Propylene Glycol	76	188.2	58	Complete	
Dipropylene Glycol	134	231.8	107	Complete	

CARBIDE and CARBON
CHEMICALS CORPORATION
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.



Offices in Principal Cities
In Canada:
Carbide and Carbon Chemicals, Limited, Toronto

For Stockings at their Loveliest

This lovely fabric was touched by seven hands during finishing operations—yet reached the hosiery buyer with a smooth, fresh, "buy me" appearance. Filaseal Resin Finish makes the difference. Filaseal, applied in the finishing bath after the dye is dropped, gives fabrics the body and snag resistance required for high speed boarding, examining, pairing, folding and packaging. That's why hosiery buyers like fabrics finished with Filaseal.

Filaseal

—to cut down snags and pulls

Stockings that look "handled" stay on the hosiery counter until all the "fresh" stockings are sold.

Stockings finished with Filaseal sell faster because they look better . . . stay smooth and fresh.

Filaseal is a product of Amalgamated Chemical Corporation, Philadelphia 34, Pa. Southern Rep.: Robert A. Bruce, P.O. Box 35, Greensboro, N. C.

KELTEX

FOR

excellent printing

with acetate, acid and direct colors on acetate, viscose and pure silk dress goods

Photo Black Star

• You get all the advantages of good color yield and sharp line — sparkling prints that strike a perfect note in fashion's color harmony — when you use Keltex, the modern algin thickening agent.

Keltex gives you exact, unvarying printing paste viscosity; assures perfect penetration and superior printing results. It is equally effective in machine or screen printing on cotton, pure silk, wool or rayons. Gives excellent printing with direct, acetate and acid dyes or white discharge.

You get consistent uniformity and stability with Keltex because Keltex is a non-variable compound rigidly processed to exacting standards. Keltex is entirely free of grit or other foreign matter. Easy and economical to use, it requires no cooking or special treatment, and is easily removed in the final washing to give a soft and pliable hand to printed goods.

Our Technical Service Department will be glad to cooperate with you fully in advising how Keltex can meet your particular requirements. Write to our nearest regional office.

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A PRODUCT OF

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REFINED ALGIN PRODUCT

FOR COTTONS, RAYONS, MIXED GOODS

RAPIDASE saves you money because

1—It de-sizes efficiently at high speeds.

This fast-acting enzyme is particularly adaptable for high-speed continuous de-sizing ranges, shorter time in the box or fewer ends on the jig.

2—It is effective in low concentrations.

This concentrated product can be used advantageously in concentrations as low as one tenth of 1%.

3—High temperatures can be used to increase its activity.

The starch-solubilizing action of Rapidase is doubled with each 18° rise in temperature between 120° and 200° F, permitting advantage to be taken of the increased penetration and easier removal of the decomposition products at the higher temperatures.

RAPIDASE
for de-sizing®

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WALLERSTEIN COMPANY, INC. 180 MADISON AVENUE, NEW YORK 16, N. Y.

a dyestuff for cellulose acetate yarn and nylon

BLACK SN NEW

Eastman Black SN New is a highly refined soluble dye base. Diazotized and developed with beta-oxy-naphthoic acid, it dyes acetate yarn a dense neutral shade of black which retains its cast under both daylight and artificial light. It dyes nylon a slightly greener shade.

When heated with direct steam, Black SN New will not tar in a water medium. It is highly recommended for cross-dyeing, since it stains viscose rayon and cotton only slightly. At low temperatures, it penetrates and levels well with good exhaustion of the dyestuff. Blacks obtained by either jig or box method meet general commercial fastness requirements and offer exceptional resistance to sublimation and crocking.

Eastman Acetate Dyestuffs are available in a wide variety of useful colors which have been developed especially for the dyeing of cellulose acetate yarn. Further information about these dyestuffs can be obtained by writing to Tennessee Eastman Corporation (Subsidiary of Eastman Kodak Company), Kingsport, Tenn.

Eastman Acetate Dyestuffs

IT PAYS to kick out the kettle on your STARCH COOKING jobs!

For centuries, kettle cooking methods have served mankind well enough. This is the case no longer when it comes to modern, large-scale textile starch cooking problems—and the important business of keeping costs in line with profits.

For example, a certain textile printer who cooks 275,000 gallons of starch paste per month, for printing gum. This big heat transfer job got too expensive with the traditional open-kettle system. So he saved himself $3,000.00 per month by changing to continuous, closed controlled cooking and cooling with VOTATOR heat transfer apparatus.

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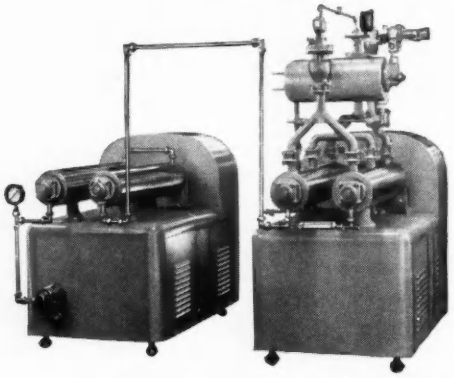

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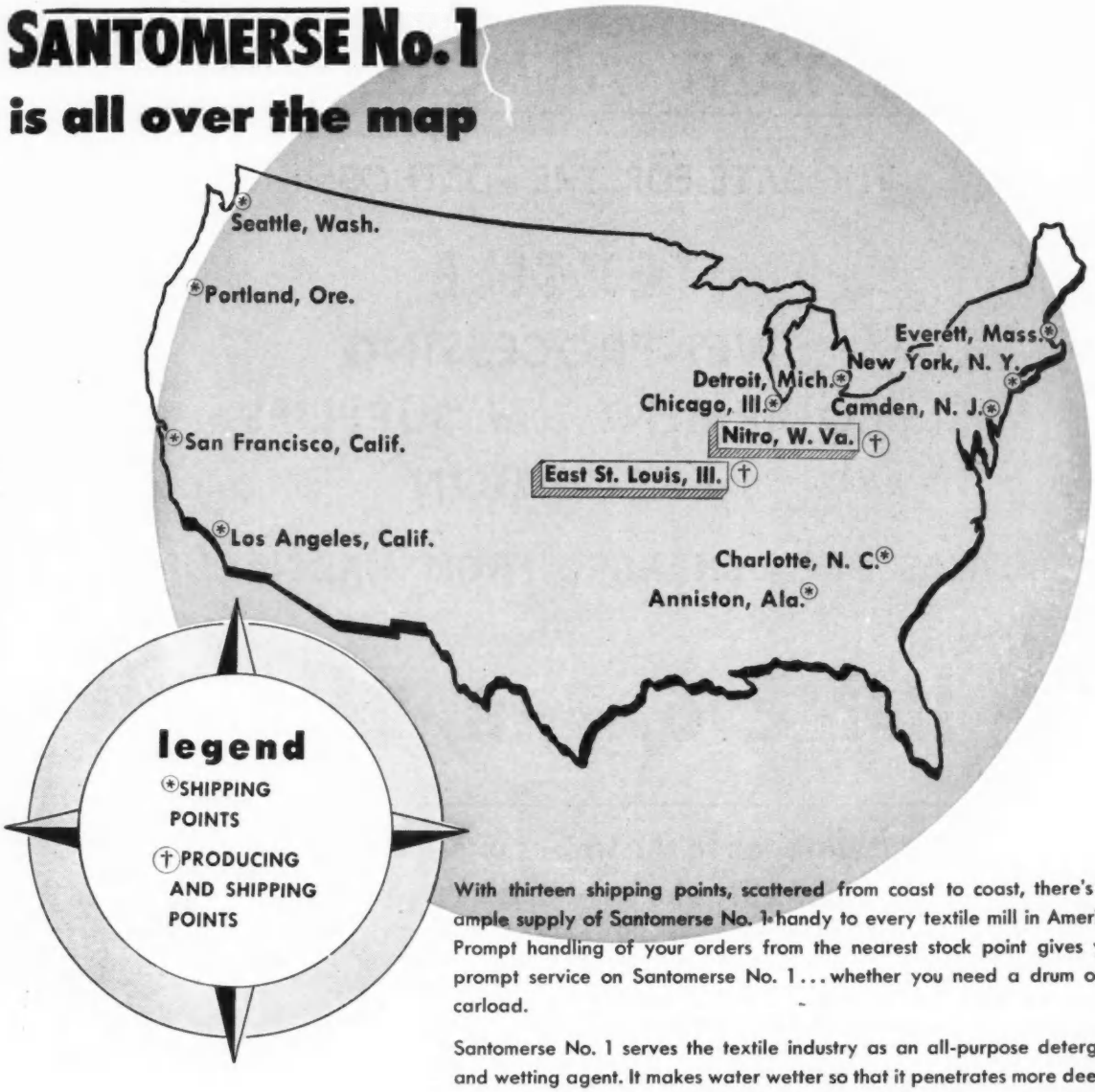

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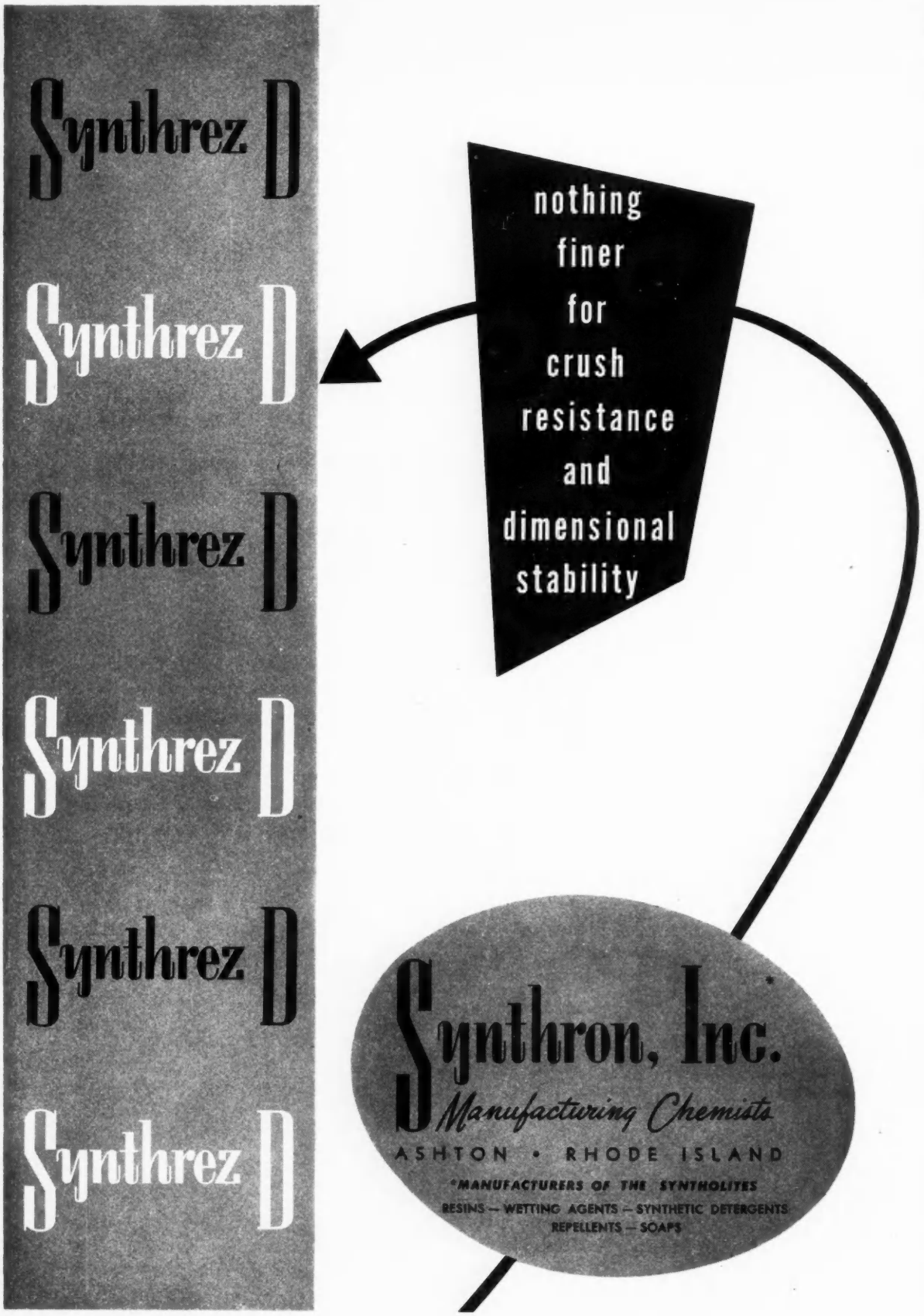
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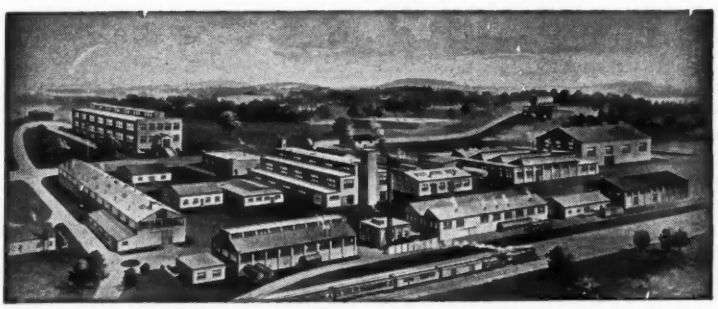

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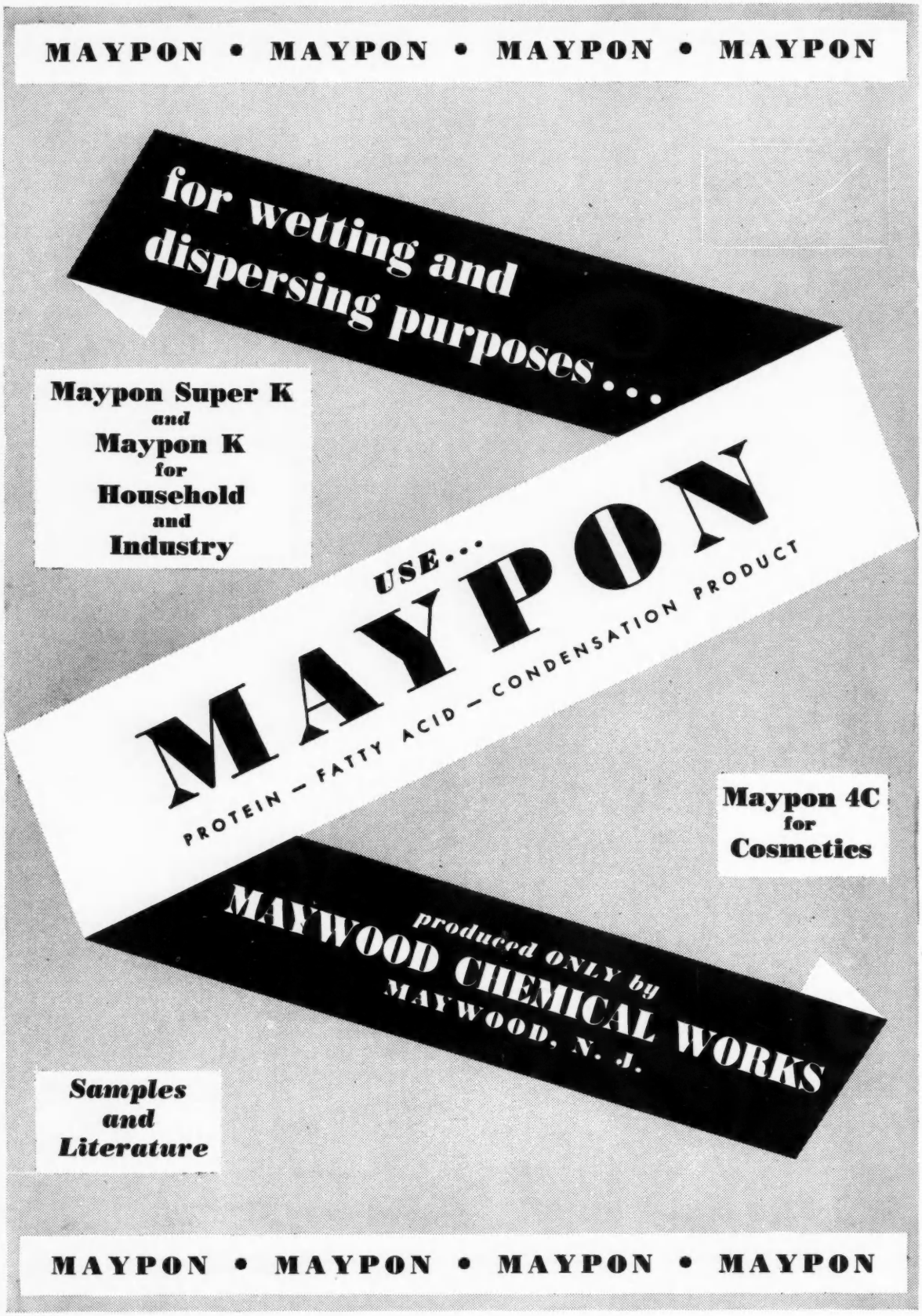
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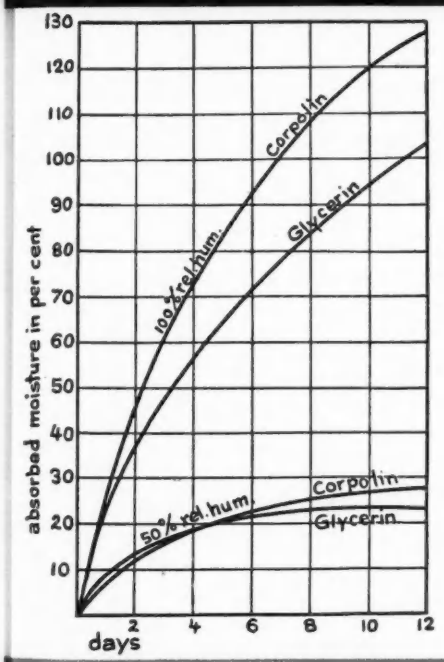

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VOLUME 38 NUMBER 3

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WHO WAS THE DISCOVERER OF HYDROSULFITE NF?*

By DR. R. HALLER
Reihen

Translated by
P. J. WOOD
Technical Director, Royce Chemical Company

ANYONE who lived through the time around the turn of the century as a practical colorist knows that it was a classic era, when the appearance of the hydrosulfite compounds in the domain of textile printing caused such a development as can only be compared with the time when the first synthetic dyestuff was made available to the dyeing and printing industry.

The *Bulletins de la Société Industrielle de Mulhouse* and the *Zeitschrift für Farben und Textilchemie* of the years 1902-5 reveal the amazing influence of this discovery on the dyeing and printing industries. The young colorist of the present day has no idea of the difficulties in textile finishing which have been eliminated by the application of hydrosulfite, as this assistant has become today one of the regular tools of the colorist, without which he could not carry on the business of textile printing. It must be remembered that the enormous development of the indigoid and anthraquinone vat dyestuffs would not have been possible without hydrosulfite.

Who was, then, the discoverer of sulfoxylate formaldehyde, today's Hydrosulfite NF of Höchster Farbwerke? In the literature, we find many contradictory details, concerning this matter.

If one excepts the doubtless unknowing use of hydrosulfite preparations published by Peliza and Zuber in *Bulletin de la Société Industrielle de Mulhouse*, 70, 49, (1900), in which these two colorists made printing pastes which contained bisulfite compounds, aldehydes and ketones as well as zinc dust, let us next consider the statement in the monograph on hydrosulfites by Jellineck, which reads as follows: "A substantial advance, both in theory and practice, has been made by the discovery of the condensation products of aldehydes and ketones with sodium hydrosulfite by Schwarz, Baumann, Sünder and Thesmar." This discovery was deposited by the Zündel Works in a sealed communication to the *Société Industrielle de Mulhouse* under date of Dec. 15, 1902, #1361.

Apparently unconnected with this in any way, we find another sealed communication was deposited by Camille Kurz on December 1, 1902, #1357, describing the preparation of compounds of hydrosulfite and formaldehyde and their use in discharge printing of paranitraniline red.*(2)*

One learns further, from a letter written by J. Garcon to Lefevre*(3)* that this C. Kurz with his idea of the addition of formaldehyde to hydrosulfite, provided the stimulant for the work done on hydrosulfite-formaldehyde by the chemists of the Zündel Works in Moscow. In this letter, the names of Schwarz and Sünder do not appear at all.*(4)*

In the well-known book of Diserens*(5)*, noted is the following, concerning the history of the development of hydrosulfite-formaldehyde. According to Diserens, C. Kurz of Darnetal was the first to deposit a sealed communication with the *Société Industrielle de Mulhouse* in which the observation is made that the addition of formaldehyde to a printing paste containing hydrosulfite has a beneficial effect in the discharging of paranitraniline red. He gives second place to the chemists of the Zündel Works, Schwarz, Baumann and Thesmar (Sünder is not named), who deposited a sealed communication in Mulhouse on December 15, 1902, concerning this matter. In the third place he names R. Russina of the Kattunmanufaktur in Eilenburg, who made the same claim in 1903, allegedly independent of the above mentioned men. At the Congress of the I.V.C.C. in Dresden in 1926, the chemists R. Russina, Charles Schwarz, Lucien Baumann and K. Reinking were awarded the gold medal of the Association for their work in this particular domain.

The invention of C. Kurz was evidently taken over by Descamps in Lille, who took out French Patent #337530 on February 23; the firm of Cassella in Lyons took out a license under this patent and put on the market sodium sulfoxylate formaldehyde under the name of Hyraldite A. The Farbwerke Hoechst adopted the method of the Zündel Works and patented it under D.R.P. #280 (Feb. 25, 1903). It seems astonishing that the Zündel Works did not patent their invention, which would have been the normal procedure, but that the Farbwerke Hoechst did do so, fully a year after the deposit of their sealed communication.

Mention must be made of a private communication from my one-time colleague, R. Russina, of Eilenburger Manufaktur, according to which he and his assistant at the time, Kunert, were the discoverers of hydrosulfite-formaldehyde, and that this method was revealed in a U.S.A. patent in 1903. I have mentioned this personal letter of Russina, the trustworthiness of which I had absolutely no occasion to doubt, at the time, in *Handbuch des Zeugdrucks*, Vol. 1, p. 584, 1930, although I never saw the U.S.A. patent.

In this discussion as to who was the actual discoverer of the hydrosulfite-formaldehyde double compound, one point should

* Reprinted from Textile-Rundschau.

not be overlooked. That is, to determine, on the one hand, who first prepared the product, and on the other hand, who first used it for discharge purposes.

Hence it appears, from the sealed communication of the Zündel Works of December 15, 1902*(6)*, that not only was the preparation of the product described, but also its application in the discharge of paranitraniline red. From the sealed communication of Camille Kurz dated December 1, 1902, it appears further(7), that he knowingly prepared the double compound of hydrosulfite and formaldehyde in the printing paste itself and that he then used this for discharge printing direct and basic colors.

Whether the U.S.A. patent of Russina, which has never been found in spite of the thorough search made by Dr. Wengraf, covered the preparation of sulfoxylate-formaldehyde alone, or also its application in discharge work, I must leave alone, although I remember having heard Russina say that the discharging of para red was also protected by the patent.

On the basis of a study of the literature, the unbiased judge can come to no other conclusion than that Camille Kurz was the discoverer of hydrosulfite-formaldehyde. The sealed communication deposited by him is dated December 1, 1902, that of Zündel Works, December 15, 1902. Kurz is therefore 14 days ahead with his priority claim and will be regarded by every unprejudiced technician as the discoverer of sodium sulfoxylate formaldehyde.

The prior claim of Russina remains problematical, being unsupported by documentary evidence; I have already indicated above that the search made by Dr. Wengraf in the Washington Patent Office for the alleged Russina patent was fruitless.

In the light of this array of facts it is really very strange that on December 8, 1903, the Farbwerke Hoechst vorm. Meister, Lucius und Brüning, applied for a German patent covering a method for preparation of stable hydrosulfite compounds*(8)*, the contents of which was nothing more than what the Zündel chemists, on the one hand, and Camille Kurz, on the other hand, deposited as sealed communications about a year before. Using this method, the Farbwerke Hoechst put this product on the market under the name of Hydrosulfite NF. It is astounding that the Zündel chemists and Camille Kurz were all satisfied with the sealed communication, which indeed established the priority of their findings but gave them no protection.

There now remain only Camille Kurz and the Zündel chemists, but after all it is hardly possible that a group of four or five colorists could be the inventor, the invention must be ascribed to a single person; but to whom?

When I commenced my research for the holder of priority of discovery of sodium sulfoxylate formaldehyde, there still lived several of the Zündel chemists, Schwarz, Bauman and Thesmar. The way to a solution of this complicated matter was therefore to make personal contact with the participants. Schwarz was known to me personally as the former Director of Koechlin-Baumgartner & Co. Lucien Baumann I had met personally during my career as a colorist; Thesmar I knew only through references in the literature. Sünder had died in the meantime and Russina had died years ago.

Through the mediation of Dr. Neff I was thankful to receive, shortly before his death, a detailed letter from Mr. Charles Schwarz. In addition there came to me from Mr. Thesmar, now president and general manager of "Societe Anonyme des Matieres Colorantes et Produits Chimiques de St. Denis" a communication concerning the events leading to the discovery of the hydrosulfite derivatives, also about his colleague, Baumann.

Through contact with the gentlemen named, I have got into the right position to obtain a clear understanding of the somewhat mysterious history of the discoverer of hydrosulfite. From the revelations of the above men the following is therefore clear:

At the Paris Exposition in 1900, Mr. Baumann saw samples of solid sodium hydrosulfite, exhibited by the B.A.S.F. He had some of it sent to Moscow and it was he that caused Thesmar to start the research, writes Mr. Schwarz, with this product for discharging azo color dyed grounds. But the instability of the printing paste did not give regular results. Better results were obtained with zinc hydrosulfite prepared in their own laboratory; this also was unsatisfactory. In order to arrive at something that would give useful results, various additions to the hydrosulfite print paste were made, amongst others formaldehyde, and to everybody's surprise, printing pastes with this addition gave excellent white discharge on para red.

Up to this point the written communications of Schwarz on the one hand and Thesmar and Baumann on the other, are in agreement. The preparation of pure hydrosulfite-formaldehyde took place without difficulty.

Schwarz was, at that time, technical director of Zündel and Baumann his assistant; Thesmar was evidently third chemist and occupied himself also with laboratory work. That he had to impart the knowledge of the worthwhile discovery he had made to Charles Schwarz is self-evident. Schwarz, for reasons which cannot be more precisely discussed, did not protect the process by patent rights; at first even a sealed communication was neglected.

That such an important discovery in the laboratory could not be kept secret is understandable. An assistant chemist, M. Eckert, getting wind of the affair, lost no time in reporting the new method to his friend, Camille Kurz, who not only took cognizance of it, but he did what Schwarz really should have done. On December 1, 1902, he registered a sealed communication in Mulhausen. So it happened that the firm of Zündel, actually the discoverer of sodium sulfoxylate-formaldehyde, lost the fruits of their invention, the priority, as the consequence of careless indiscretion. The uninitiated will credit Camille Kurz with the discovery, and it is time, although very "post festum," that this error should be corrected and that the true inventor should be accorded his rights. The actual inventor of sodium sulfoxylate formaldehyde is, therefore, Georges Thesmar. At the same time it should be emphasized that the suggestion of working on the hydrosulfite problem came from L. Baumann.

How the method came to the knowledge of Farbwerke Hoechst must remain unanswered.

In the "Handbuch des Zeugdrucks" the above indicated points should be stricken out, as they are incorrect, and in the literature, in future G. Thesmar should be credited as the discoverer of sodium sulfoxylate formaldehyde.

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2. Zeitschrift für Farben und Textilind. 1904, page 54.
3. Revue Generale des matieres colorantes. 1905, page 125.
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6. Zeitschrift für Farben und Textil industrie. 1904, page 55.
7. Ibid. 1904, page 54.
8. Ibid. 1904, page 80.

* * *

Mr. Wood corresponded with W. H. Cotton, who was formerly a technical expert with the I.G. in Germany, asking for comments he cared to make on the above article. Mr. Cotton's comments follow:

I was not connected personally with Zündel's but was with the Schlusselburg Calico Printing Company in Russia at the time when Zündel's were working on hydrosulfite discharges. Shortly after that I joined the Farbwerke Hoechst as a technical expert. I knew Schwartz (who wrote his name with a "t"), Baumann, Thesmar and Russina fairly well, but never met Camille Kurz or Eckert, who are also mentioned by Haller.

I think that Haller is right when he says that Thesmar is the real discoverer of Hydrosulfite N.F. At that time Schwartz was the manager, Baumann the assistant manager, and Thesmar a young chemist at

(Concluded on Page 112)

• PATENT DIGEST •

PAUL WENGRAF

Slipproofing Textiles—Colloidal Silica Solution G, 1

U. S. Pat. 2,443,512
(Monsanto Chem. Co., Powers-Harrison, June 15, 1948)

While generally threads are slipproofed by using organic resins or rosins, gelatin, casein or other albuminous substances, the inventors have observed that good and stable effects can be obtained by applying colloidal silica solutions to the fibers. This colloidal silica solution is used in a relatively dilute condition; preferably a small amount of a wetting agent and/or a softening substance are added to this slipproofing finish. The solutions may be prepared in different days. Generally a mineral acid is added to a water soluble silicate whereby first a gel results. This gel is washed with water to remove the salts formed in the reaction. Thereupon it is covered with a weak alkaline solution and heated while avoiding evaporation of water until the gel has been substantially transformed into a sol. The process of conversion has been formerly described in U. S. Patent 2,375,738 (White, assigned to the same company). Solutions prepared as described above are stable for an indefinite time. They can be applied to all types of cellulosic fibers in form of threads, slivers or raw stock. A sliver can, for instance, be immersed in this solution, squeezed out so that a pick-up of 100% results, dried and made into a yarn. The final products (knitted or woven fabrics) are not only slipproof but they exhibit moreover a high tensile strength (increase up to 22%). It is said to be advisable to add some di-octyl sulfosuccinate (Aerosol) to this kind of slipproofing agent. This patent covers the manufacture of the product, marketed under the tradename "Syton".

Reference cited by the U. S. Patent Office, among others:

U. S. Pat. 2,387,367 (Du Pont) describes adhesives consisting of silicates, combined with cumarone or indene resins.

Static Electricity Prevention—Covering Fabrics with a Conductive Sheet G, 1

U. S. Pat. 2,443,782
(Pacific Mills, Barnard et al., June 22, 1948)

The accumulation of static electricity on woven fabrics may be a serious drawback and even dangerous when the textile material moves through rooms filled with explosive gases (dry cleaning plants, hospital rooms filled with anesthetic fumes, etc.). The principal idea of this invention is to give the fibers first a positive electric charge by impregnating them with quaternary ammonium compounds such as benzyl-cetyl-dimethyl ammonium halide or the like. The textiles thus prepared acquire some affinity for electronegatively charged conductive substances, for instance coal or graphite, dispersed with an alkylnaphthalene sulfonate as stabilizer. According to an example a cleaned cotton cloth is treated with a hot solution of 1% acetic acid to eliminate all possible alkaline reactions. Thereupon it is soaked in a 2% cetyl-dimethyl-benzyl-ammonium chloride solution, squeezed and immersed in a carbon black dispersion to which some Nekal-type surface-active agent has been added. The resistance in ohms of the prepared fabrics was measured. It was almost nil when compared with the ohm-resistance of the non-prepared material. Static electricity was immediately removed upon formation and rendered innocuous.

References cited by the U. S. Patent Office, are, among others:

U. S. Pat. 2,338,480 (Westinghouse Electric): graphite is embodied in a composition to lower the friction. A wetting agent is added for improving the distribution of this material.

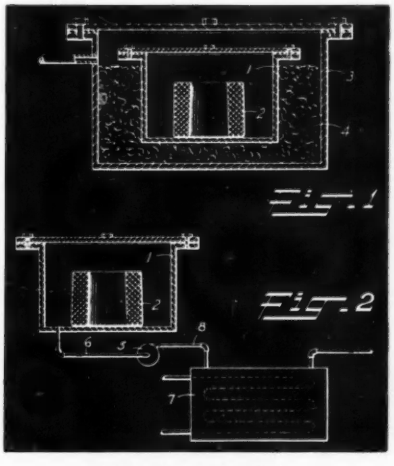
U. S. Pat. 1,327,904 (Goodyear Tire): a fabric is impregnated with a lubricant, consisting of a graphite suspension.

Drying Fabrics and Yarns, Based on a Freezing Operation G, 3

U. S. Pat. 2,444,124
(Am. Viscose Corp., Wodler, June 29, 1948)

Artificial threads, fabrics, etc., formed in the usual way from spinning dopes are usually dried by the application of heat or circulating air. In this event the material tends to shrink during the drying process and even afterwards the dried products possess a high residual shrinkage capacity. Irregularly shrunk fibers have the further drawback of dyeing unevenly. In order to overcome this disadvantage the patent proposes to dehydrate moisture-laden cellulosic products by a process avoiding completely any-heat drying procedure. The principle of the present invention consists of transforming the material into a completely frozen condition, for instance by subjecting it—preferably at a very high speed—to a temperature as low as minus 70° C. The moisture is quickly brought in a solid state and subsequently sublimed off by evacuating the container in which the cellulosic material has been placed. The moisture is removed without passing the liquid phase. The necessary low temperature is maintained by applying a freezing bath or dry ice (CO_2) or by spraying the container with liquid air. Thereupon the cooled container is removed from the freezing bath and connected through a high vacuum pump to a condenser. It is recommended to keep the material constantly at a temperature below 0° C. during the evacuating operation so that sublimation occurs without melting of the frozen moisture. The crystalline structure and porosity of the textile fibers can be controlled by the speed at which the freezing step has been carried out; large particles of ice are formed when freezing is effected at a relatively high speed and the fiber remains after the sublimation process in a highly porous state. By slower freezing inversely a lesser degree of porosity (with larger individual pores) can be observed. The method is illustrated by the accompanying drawing: a vessel (1) contains a viscose cake (2) or another structure of rayon. (4) is the freezing bath in which the container is immersed. As soon as the moisture is completely frozen the container (1)—see Fig. 2—is removed and connected by vacuum pump (5) with the condenser (7).

References cited by the U. S. Patent Office are, among others:



U. S. Pat. 2,444,124
Drying Fabrics and Yarns

U. S. Pat. 2,354,200 (United Shoe Machinery): describes an analogous method for drying hides and skins by first deep-freezing and thereupon removing the ice at sub-freezing temperatures.

U. S. Pat. 2,345,548 (F. J. Stokes): a mtthod for desiccating sera, biological materials and the like by deep freezing and withdrawing the moisture while the mass is still in a frozen state.

U. S. Pat. 2,028,296 (Carbide & Carbon): suggests removing water of gelation from freshly coagulated and washed material, for instance in form of a film by freezing the water and thawing the film thereupon so that water can be removed subsequently by draining off.

Thus it can be concluded that drying methods based on freezing and eliminating the frozen moisture by a vacuum treatment are known as well in processing biological material (see also U. S. Pat. 2,353,986 Sharp and Dohme or U. S. Pat. 2,388,134, Stokes) as in drying leather. This procedure is apparently new however in the drying technique of artificial fibers. Treating wool fibers at low temperatures for removing wool fat and at the same time adherent moisture has been suggested in U. S. P. 2,015,893/4 (Frosted Wool). The freezing operation is followed here by a mechanical treatment to remove the frozen substances but not by sublimation in a high vacuum.

Dyeing Cellulose Acetate—Saponification Mixture C, 4, 07

U. S. Pat. 2,445,064

(Tootal Broadhurst, Hall-Wood, July 13, 1948)

The patent describes an alkaline composition consisting principally of a concentrated alkaline substance, an organic liquid in which the alkali is soluble (preferably a lower alcohol) and an organic non-solvent for the alkali, being at the same time a solvent for the lower alkali. An example for this latter ingredient is white spirit. As an example the following formula is indicated: 90 ml. white spirit are mixed with 10 ml.n-butanol in which 0.6 g. caustic soda have been dissolved. A cellulose acetate fabric is steeped for 10 minutes at 16° C. in this liquid, soured and washed. It was evenly dyed by Chlorazol Direct Blue. This alkaline composition can furthermore be used for other special purposes such as saponification of esters, metal cleaning, etc.

References cited by the U. S. Patent Office are, among others:

U. S. Pat. 2,185,332 (Crampton): protects a composition, consisting of a metal alcoholate and a solvent which can be used for refrigerating purposes.

U. S. Pat. 2,113,942 (Squibb): a mixture for refining therapeutic oils is composed from an alkaline soap, alcohol and ethylene dichloride.

U. S. Pat. 2,091,970 (H. Dreyfus): acetate of cellulose is swelled in a bath, containing methylamine, ethylene diamine or other non metallic bases.

Another reference could be found in U. S. Pat. 2,049,431 (Dreyfus) suggesting a mild saponifying process for acetate cellulose comprising the use of earth-alkaline hydroxides to which alcohol and protective colloids are added.

Printing Indigosol 04B—Naphtholsulfonates Added D, 2, 04

U. S. Pat. 2,445,632

(Dow Chemical Co., Pelton-Hutchenreuter, July 20, 1948)

Developing Indigosols in a continuous steaming (ageing) operation is most convenient, economical and therefore preferred to the method of developing in an acid bath. It is known that one of the frequently used Indigosol brands, Indigosol 04B (derived from 5-7-5'-7'- tetrabromoindigo) cannot readily be developed by steaming but only by immersion in an acid developing bath. Christ in *Journ. Soc. Dyers and Col.,* 1938 (54), 94, characterizes this dyestuff as "inert" with respect to the speed of development. The inventors discovered however that Indigosol 04B can likewise be developed in a steaming operation, provided that its alkali salt is mixed with an alkali salt of a naphthol sulfonic acid (for instance 6-naphthol-4-sulfonic acid, 1-naphthol-2-sulfonic acid, 2-naphthol-7-sulfonic acid). Amounts of 3-20% of this ingredient calculated on the weight of the Indigosol dyestuff are preferred. The mixtures of Indigosol 04B with the naphthol sulfonic acid salts are more stable in evaporated (powder) form than in liquid media. An example indicates a composition containing 50 p. Indigosol 04B (of 83.5% dyestuff concentration), 7.5-11.3 p. of one of the naphthol sulfonates enumerated here above, the balance being dextrin thickener. While the print according to the normal formula did not give any appreciable color yield, the prints to which one of these naphtholsulfonates was added showed excellent deep and uniform shades.

Reference cited by the Patent Office:

U. S. Pat. 2,173,824 (Du Pont) describes a vat printing paste, characterized by blending the vat dyestuff with benzyl alcohol and a higher alcohol-soluble sulfate.

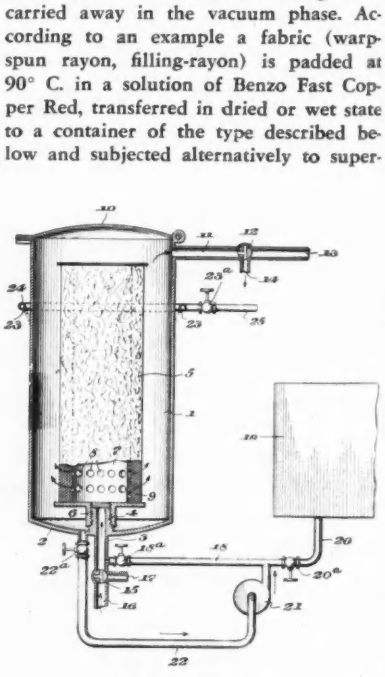
Another reference can be mentioned: U. S. Pat. 2,029,351 or Brit. P. 421,606 (Imp. Chem. Ind.) suggests the addition of benzylsulfanilate and dibenzyl-sulfanilate respectively, to Indigosol prints. These additions of solution salt (dissolving salt) are suggested quite generally. The addition of naphtholsulfonates however seems to have a specific effect not yet observed on the Indigosol brands derived from bromoindigo dyestuffs.

Dyeing Apparatus—Fixing Colors by Alternating Pressure and Suction C, 6

U. S. Pat. 2,446,502

(Wehrli, Aug. 3, 1948)

The former methods for fixing dyestuffs on textile materials in dyeing processes required a long operation by gradually increasing the temperature of the dyebaths. As far as printing processes are concerned the fixation is rather superficial and irregular according to the preamble of the present specification. Thus the problem of uniformly fixing and at the same time sufficiently penetrating the dyed material has not been satisfactorily solved up to now. The inventor claims to have found a perfect solution by subjecting the previously colored textiles in a closed vessel to an alternating high and low steam pressure. This change of steam pressure conditions is preferably carried out in quick succession and the result is a deep impregnation within a relatively short time. The change of the pressure into the vacuum region is carried out while automatically ventilating the tissue. The single fibers of the material swell first when subjected to the action of steam whereby part of the air is removed from the fibrous material. The remaining air is carried away in the vacuum phase. According to an example a fabric (warp-spun rayon, filling-rayon) is padded at 90° C. in a solution of Benzo Fast Copper Red, transferred in dried or wet state to a container of the type described below and subjected alternatively to super-



U. S. P. 2,446,502
Dyeing Apparatus

atmospheric pressure (1.2-2.2) and to a slight vacuum. The procedure was repeated three times within a period of 20 minutes. Thereupon the usual fixation with acetic acid and coppersulfate followed. A completely uniform dyeing effect was noted. The accompanying drawing shows a container (1) in which the textiles (5) are placed. Steam is led through pipe (16) into the container and escapes through outlet 11). As soon as the container is filled with steam the valves (15) and (12) are closed. A cold water feed pipe (25) surrounds the container. The steam filled container is cooled by spraying cold water through nozzles (23) over the outside wall of the container. Steam is condensed and a partial vacuum results whereby the dye liquid (19) is sucked through pipe (18) in the container, penetratring the textile goods. Thus steam pressure and vacuum alternate. The change is easily performed by turning the three-way cocks in the appropriate way.

References cited by the U. S. Pat. Office are, among others:

U. S. Pat. 2,210,832 Singer Manufacturing Company): wood is colored by treating the material with steam pressure and vacuum alternatively.

U. S. Pat. 2,106,634 (Carthage Mills): relates to an intermittent fixing (steaming) process, applied on pile fabrics.

U. S. Pat. 2,005,637 (Filastic Holding S. A.): proposes to introduce rubber latex into fibers by an alternative pressure and vacuum treatment.

U. S. Pat. 1,861,624 (Deltex Comp., Chapin-Jacoby): describes a special (in the printing technique well known) ager construction characterized by supplying a correct amount of moist steam at these points where local heat is generated by chemical reducing action.

Other references: Brit. P. 450,698 (Beyer) suggests evacuating the dyebath container in order to improve the penetration of the material by the dyebath solution. Ger. Pat. 636,822 (Obermaier et al.) shows a construction of a jig dyeing device. The jig is placed in a container which can be evacuated, while the dyestuff solution is sprayed into this container under external pressure. In the meantime the fabric is automatically wound and rewound on and off the jig rolls.

Modification of Cellulose Structures—Copper-alkylolamine Treatment G, 2, 01

U. S. Pat. 2,446,682
(Chemical Laboratories Inc., Whitner, Aug. 10, 1948)

The present patent mentions the subsequent effects obtained in a process which will be described below: the physical appearance of the treated yarn or cloth is substantially modified, the twist of the yarns is changed, the luster has slightly decreased and the feel (the hand) of the goods becomes more firm. These results are brought about by a treatment with copper complex compounds which are formed by reacting an alkylolamine with a copper salt (copper sulfate or copper chloride). A deep blue solution, similar to that of copperammonium sulfate or the like results. Bleached linen cloth was saturated with the solution and exposed for 18 hours to the atmosphere. The fabric was light blue and after removing the copper salts by a treatment with dilute acids the fabric was much lighter in color than a non-treated sample. Claims protect the use of complex compounds of mono- or poly-hydroxy alkylolamines such as 2-amino-2-methyl-1-3-propane diol:

$$CH_2OH\text{-}C(CH_3)\ NH_2\text{-}\ CH_2OH$$

It is probable that part of the cellulose is superficially dissolved in the copper complex solution. Cellulose solutions in ammonia, as well as in ethylene diamine copper complexes have frequently been used as finishing agents. It might be principally referred to the permanent finishes recommended in U. S. Pat. 1,661,879-881 (Arnold Print Works-De Goencz) of 1928 which comprise treatments with copperammonium solutions; they exert a partial solvent and specific finishing effect on cellulosic threads and fabrics.

References cited by the U. S. Pat. Office are, among others:

U. S. Pat. 2,332,047 (Rohm & Haas): suggests animalizing cellulose derivatives with melamine compounds in order to increase the affinity of dyestuffs.

U. S. Pat. 2,310,257 (Albi Chemical): copper compounds such as copper fluoride are incorporated into cellulosic fabrics as preservative agents against micro-organisms.

U. S. Pat. 2,189,918 (Celanese): process for increasing the affinity of regenerated cellulose to direct dyestuffs consists of treating the material with water soluble amines, for instance with ethylene diamine.

U. S. Pat. 2,148,659 (Ciba): solutions of copper sulfate in triethanolamine (as described in the Whitner patent here above) are used for aftertreating direct dyestuffs.

Other references are: Finishes using cuprammonium solutions are well known as reported above by quoting the De-Goencz patents. Modifications can further be found in Brit. P. 489,402 and U. S. Pat. 2,089,775 (Arnold Print Works), in U. S. Pat. 2,111,486 (Bancroft) and U. S. P. 1,896,620 and 2,111,531 (Heberlein), etc. These copper complex solutions often had the drawback of quick decomposing in storage. It is quite possible that the copper-alkylolamine complexes are more stable and therefore more fit for practical use.

Water Repellent Fabrics—Esters of Oxyaromatic Compounds G, 2, 02

U. S. Pat. 2,448,247
(The Cravenette Company, Bellwood, Aug. 31, 1948)

This process intends to make cellulosic fibers as well as those of animal origin (thus rayon, linen, jute, casein fibers, nylon) persistently water repellent. The material is protected against rain and snow and the effect is said to withstand the usual dry-cleaning processes. Another advantage has to be seen in that the hand of the textiles is not changed by this treatment and that the fibers can be restored to the same condition as before the operation. In contradistinction to well known methods the material is treated with certain aliphatic substituted aromatic esters. Examples of these esters are o- or p-stearyl-oxybenzoic acid and another series of compounds of this type. The esters are, for instance, prepared by reacting stearylchloride with o-hydroxybenzoic acid (salicylic acid) or the like. The resulting substance is cooled and dissolved in dilute soda lye. The pH of this solution is about 8-10. A cotton or poplin fabric was dipped in a 1%, in another case in a 5%, solution and squeezed out. After the usual mild drying operation (120° F.) the goods were baked at 300° F., thus processed the same way as in the Zelan technique. The spray test rating was 90-100. Each sample subjected to several laundering treatments was found to retain most of its water-repellency.

References cited by the U. S. Pat. Office are, among others:

U. S. Pat. 2,337,924 (Gen. Aniline, Platz): describes capillary-active compounds of the type of dodezyl-p-methoxybenzene sulfonate. This product can also be used for leather treatments.

U. S. Pat. 2,313,741 (Du Pont): the stearamido methylether of glycolic acid is used in water repellent finishes.

U. S. Pat. 2,146,392 (Imp. Chem. Ind., Baldwin-Walker): the original Velan-Zelan patent applying reaction products of aliphatic acid amides, formaldehyde and pyridine.

U. S. Pat. 2,125,072 (Baumheier-Kern): textile auxiliaries are prepared from dialkylaromatic sulfonates, the alkyls consisting of long chains.

Another reference is U. S. Pat. 2,385,940 (Nat. Oil Prod.): high substituted salicylic acid amides are the basic compounds in producing water-repellent agents of the Zelan-type.

Dyeing Wool—Direct Dyestuffs G, 4, 01

U. S. Pat. 2,448,448
(Courtaulds Ltd., MacGregor, Aug. 31, 1948)

The present patent refers to U. S. Pat. 2,238,949 (Schlack-Duisberg) which teached preparing animal fibers with urea, guanidine or other compounds of this class. It could be assumed that these compounds react with amino or imino groups of the wool molecule; a detectable chemical reaction between these two components was reported. The purpose of this process was to increase the affinity to certain dyestuffs and to reduce thereby the dyebath temperature. The present specification states that this and similar treatments were found to increase likewise the affinity of direct (cotton) dyestuffs to nitrogen-containing textile fibers such as wool, silk, casein or nylon. Up to now generally direct dyestuffs could not be applied in wool dyeing neither in regular dyeing operations nor by adding quaternary ammonium compounds to the dyeing liquids. The method protected by this patent consists principally of pretreating the material with certain aminocompounds, for instance with derivatives of cyanamide, dicyandiamide, melamine, guanidine or biguanide etc. but it does not include formaldehyde condensates with amino compounds. An example refers to a pre-treatment of wool with guanidine octyl succinate (thus a condensate of a wetting agent with a guanidine salt) for 30 minutes at the boil in acetic acid solution and dyeing after rinsing in a dyebath at 60° C. containing Diphenyl Brilliant Blue FF, a dyestuff which has notoriously almost no affinity for animal fibers.

References cited by the Patent Office are, among others:

U. S. Pat. 2,246,070 (Schlack-Duisberg): wool or other fibers containing nitrogen such as protein fibers, polyamides, etc., are dissolved and incorporated into cellulosic fibers to give substantivity for acid dyestuffs.

U. S. Pat. 2,238,949 (same inventors): decreasing the dyebath temperature in acid dyeing (see above).

U. S. Pat. 2,198,919 (Celanese): the patent relates to a method for increasing the affinity of completely *saponified acetate fibers* to direct dyestuffs by an ethylene diamine pre-treatment.

U. S. Pat. 2,121,337 (Gen. Aniline): refers to one of the known animalizing methods for cellulose in the use of acid dyes for dyeing mixed fabrics.

Other references: a patent having essentially the same content as U. S. Pat. 2,239,949 (see above) is Brit. P. 491,314 (Aceta G.M.b.H.). It suggests a pre-treatment of protein fibers with amidine forming agents in order to change the affinities of these fibers. Direct dyestuffs are however not mentioned in this patent nor in U. S. Pat. 2,238,949.

Dyeing—Non Substantive Solutions of Dyestuffs, Dispersed in Cellulose Ethers C, 1

U. S. Pat. 2,448,515
(Dan River Mills, Carroll, Jr., Sept. 7, 1948)

The process reported in this patent relates to a dyeing method quite different from standard dyeing operations. The principal difference is that up to now it was intended to find dyestuffs having some affinity for a special fiber which resulted more or less in a gradual exhaustion of the dyebath. The present patent however suggests to apply the dyestuff in a condition excluding any substantivity. Obviously in this event no difference of shade from one end of the fabric to the other has to be apprehended because dyeing proceeds regardless of the bath concentration. The problem is solved in the following way: the dyestuff is applied to a carrier, particularly to a cellulose ether; the dyed cellulose ether is thereupon dissolved in alkali and the alkaline solution of this re-dyed cellulose ether is applied to the fabric by padding. This dyed alkaline solution of the cellulose ether has actually no affinity whatsoever to the fiber substance. The next step consists of fixing the dyestuff to the cloth by souring the padded and dried fabric. The acid precipitates the ether which is insolubilized and thereby fixes the dyestuff. A strong cohesion between the alkaline ether solution and the dyestuff could be observed and this condition was not changed during further operations. The specification compares this new method with the pigment pad process in vat dyeing. But in the vat dyeing processes the pigments coming into contact with hydrosulfite and alkali are transformed into real dyestuffs and preferentially adsorbed and exhausted by the cellulosic fibers. Different examples are given: one of them describes dyeing cellulose ether in a circulating machine with Indanthrene Blue GCD (Colour Index 1113) in the usual way. The leuco compound is absorbed by the cellulose ether and the material is re-oxidized normally with sodium perborate or the like. A blue fibrous mass results which is first dissolved in alkali under conditions generally known for dissolving any special cellulose ether. It was quite unexpected that in this operation the dyestuff would remain closely attached to the fibrous solution and that it would not separate even in centrifuging. The padded textile fabric is finally soured in a 2% sulfuric acid solution, rinsed, soaped and washed. Other formulations are given for insoluble azo dyestuffs, direct dyestuffs and so forth. The greatly improved fastness to light is emphasized.

The U. S. Patent Office did not cite any prior art, relating to this process which is apparently quite new. Brit. P. 574,814 (Sylvania) describes a padding process with a cellulose ether solution in which a neut. met. salt has been dispersed. The cellulose solution is coagulated and the metal salts (iron, chromium, copper) are transformed into hydroxides being insoluble colored substances. This process obviously does not give a variety of colors but only a few restricted shades.

Dyeing Wool—Indigo and Indigoid Vat Dyestuffs in Ammoniacal Vats C, 4, 02

U. S. Pat. 2,450,773
(Allied Chemical & Dye Corporation, Weber, Oct. 5, 1948)

In dyeing wool or other animal fibers with vat dyestuffs, strongly alkaline vats have to be avoided. Ammonium hydroxide, sodium carbonate or organic amines, to which protective colloids (glue, gelatine, etc.) were added, have mostly been used. The possibility of adding neutral salts to ammoniacal vats in wool dyeing was considered, as the specification indicates, but rejected as unsuitable (see REPORTER 1930, 241) and adding acidic substances in order to exhaust the vat was frequently recommended. The present patent discloses that in contradistinction to this general opinion neutral alkaline salts are effective agents for exhausting ammoniacal vats in dyeing wool operations. The resulting dyeings are about 10% stronger than those obtained under standard conditions, for instance by adding ammonium sulfate. Glauber's salt is preferred in this method but other neutral alkali salts can likewise be applied, for instance potassium sulfate, KCl or NaCl. According to an example, woolen piece goods are dyed in rope form, the ratio of the dyebath being 1:20. First a bottoming composition, consisting of chrome dyestuffs, afterchromed with dichromate is applied. The goods were thereupon topped with an indigo vat, containing ammonia and hydrosulfite as usual. After circulating the dyeing liquid for about 30 minutes a 10% solution of Glauber's salt was slowly added in the cold in order to exhaust the dyebath. The goods were rinsed with cold water, scoured with soap, rinsed again and dried. They were evenly dyed in a full, well penetrated shade and possessed good fastness to crocking.

References cited by the U. S. Pat. Office are, among others:

U. S. Pat. 1,819,927 (Cheney Brothers):

describes natural silk with vat dyestuffs, hydrosulfite and a water soluble vegetable oil. No addition of salts is mentioned.

U. S. Pat. 1,716,720 (Celanese): dyeing the same type of fibers with vat dyestuffs and replacing alkali partly by alkali phenates.

U. S. Pat. 1,546,969 (Clavel): the patent describes the use of a minimum amount of alkalies used in vat dyeing silk or acetate of cellulose. Instead large quantities of water soluble salts of alkaline earth-metals (barium chloride, calcium chloride, magnesium chloride) are added.

Other references: Melliand Textilberichte, 1935, 123: this publication contemplates substituting caustic alkalies in dyeing alkali-sensitive fibers (for instance acetate of cellulose) by sodium triphosphate. The Abbott-Cox process, described in *Jour. Soc. Dyers and Col.* July, 1947, p. 224, (Richardson and Wiltshire) is characterized by impregnating fibers in a vat pigment bath to which a dispersing agent (Dispersol VL) is added; dyeing is carried out at 90° C, thereupon Glauber's salt is added and after exhausting the vat dye dispersion the vat dyestuff is reduced as usual.

Dyeing Wool—Indigo and Indigoid Vat Dyestuffs, Pigment Padded and Reduced in Acid Baths C, 4, 02

U. S. Pat. 2,450,767
(Allied Chemical & Dye Corp., Plotica, Oct. 5, 1948)

This patent differs from the invention abstracted above in that the dyeing process follows the pigment padding method by first impregnating the woolen goods with a non-reduced vat dyestuff, preferably indigo, and subjecting the fibrous material to a reducing operation in an acid medium. The impregnation with the non-reduced vat dyestuff is effected according to standard procedures by a padding mangle while reducing in the acid bath can be carried out on a jig. It is possible however to impregnate and to reduce in a single bath by using a reducing agent which is stable at lower (impregnating) temperatures and becoming effective while the bath temperature is gradually increased. The impregnation is facilitated by adding dispersing and wetting agents, for instance auxiliaries of the alkyl-aryl-sulfonate type (the specification mentions a product NR, i.e., Nacconol). As to the reducing agents which are not readily decomposed in acid solutions derivatives of the hyposulfurous type, for instance sodium or zinc formaldehyde sulfoxylate are recommended. An example for reducing bath (for instance for Indigo NAC 20% paste) mentions a solution of 5% acetic acid (56% strength), 10% glucose, 0.3% anthraquinone to which after 10 minutes, 7% normal zinc formaldehyde sulfoxylates $Zn(HSO_2\text{-}CHOH)_2$, and 3% sodium hydrosulfite are added. The pH of the liquor at the start and likewise at the end of the heating period was measured with 3.5.

References cited by the U. S. Pat. Office are, among others:

U. S. Pat. 2,297,703 (Du Pont): wool acquires an increased affinity for ammoniacal indigo vat or other dyes of this group by preparing the material with bisulfite or hydrosulfite.

U. S. Pat. 2,112,567 (Du Pont): suggests the use of a reducing composition, resistant to acid treatments. The process is particularly intended for dyeing indigo on alkali-sensitive fibers. It consists of applying zinc sodium hydrosulfite complex salts with ethylene diamine while it is indicated that other amines such as triethanolamine do not form complexes.

Other reference: in order to decrease the alkalinity of vat printing pastes applied to wool, Swiss Pat. 167,489 (I. G. Farben A.G.), suggests adding amino-acetic acid to a vat paste of the standard formula. Combinations of sulfoxylates with acids are generally used for stripping purposes (see *Textile Colorist* 1938, 174).

Discharge Prints on Copper-aftertreated Direct Dyeings D, 2, 02

U. S. Pat. 2,446,992
(Geigy, A. G., Babey-Goodall, Aug. 17, 1948)

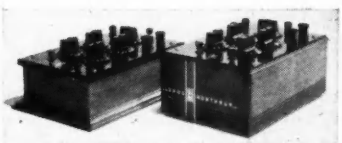
Direct dyeings resulting from either copper-containing azo dyestuffs or from aftertreatments in a copper salt solution can only be discharged in a very unsatisfactory way. Mostly brownish or brown-yellowish prints result, even when an azo dyestuff is used which is discharged pure white in a non-coppered condition. On the other hand practice asks frequently for after-coppered dyes because of their outstanding fastness to light. A method has previously been proposed comprising aftertreating the discolored discharged areas with hydrogen peroxide. This process has to be carried out in a very cautious way in order to avoid contact of the peroxide with the surrounding dyed ground. This process seems to be too complicated for general practical use. Other known methods propagating the use of urea-formaldehyde condensates and the like have the advantage of increasing the wash fastness and the disadvantage of impairing the light fastness. It has been found that after-coppered dyeings or such, produced with copper-containing dyestuffs, can be discharged pure white by means of reducing agents to which cyano-ions yielding substances are added. The cyano-ions have to be activated in the steaming (ageing) process. As such agents the following are enumerated:

1. Soluble salts of hydrocyanic acid such as sodium cyanide, or other alkali salts of the same acid.
2. Insoluble cyanides of zinc, cadmium and the like.
3. Complex salts such as sodium zinc cyanide.
4. Other compounds easily decomposed by steam to give cyano-ions such as formaldehyde-cyanohydrin, etc.

Example: rayon dyed with after-coppered Diphenyl Brilliant Blue FF is printed with a discharge paste, containing a mixture of 3 p. Hydrosulfite NF and 2 p. zinc oxide, furthermore some Hydrosulfite NF, potash, zinc cyanide (2.5%) and ammonia, thickened with starch-tragacanth. A pure white results while a paste in which zinc cyanide was omitted gives only an olive brown discharge print after ageing the usual way.

The U. S. Pat. Office does not cite any pertinent references. Cyanides in general have not been used in printing pastes, probably because of their poisonous character. They seem to form more readily removable copper-complexes than the frequently used thiocyanates. One of the numerous patents in which thiocyanates are mentioned for improving reduction discharge processes is U. S. Pat. 1,981,907 (Du Pont) suggesting the use of zinc thiocyanate.

• Cases for L&N Lab Instruments



Pictured above is the Leeds & Northrup Enclosed Switch Wheatstone Bridge, before and after the redesign of its case. Not only more modern in appearance, the new metal case is said to be sturdier and better able to stand rough handling. It is stated that its grey baked enamel finish is hard and durable—resists scratching and is easy to keep clean.

For years this instrument, like many others in L&N's laboratory line, has been mounted in a fine-grained, polished mahogany box. Adoption of a stronger, more modern design had been planned for some time, but had to be postponed because of the war. Many other L&N bridges and potentiometers will later change over to the new style case.

• ISCC Annual Meeting

The 17th annual meeting of the Inter-Society Color Council will be held on Wednesday, March 9, 1949, at the Hotel Pennsylvania, New York City. The meeting will consist of a Discussion Session at which committee chairmen will report on the following problems:

2—Color Names (Revision of), Deane B. Judd, Ch.

6—Color Terms, Sidney M. Newhall, Ch.

7—Color Specifications, Walter C. Granville, Ch.

12—Studies of Illuminating and Viewing Conditions in the Colorimetry of Reflecting Materials, D. B. Judd, Ch.

14—A Study of Transparent Standards Using Single-Number Specification, Robert H. Osborn, Ch.

A Business Session will conclude the afternoon meeting. Anyone interested is invited to attend. Hotel reservations should be made directly to the hotel at least ten days prior to the meeting, indicating that you are attending the ISCC meeting.

Meetings of the Optical Society of America are scheduled for the same hotel, March 10-12. It is usual for one or more O.S.A. sessions to be devoted to color, and it is therefore suggested that all ISCC members who are interested plan to remain for these meetings.

• Atlantic Chemical Corp.

The Atlantic Chemical Corporation of Passaic, New Jersey announces that its Nutley, New Jersey plant is now in full scale production of new intermediates for the pharmaceutical, essential oil and dyestuffs industries.

Technical data, experimental samples or plant size shipments of Vicinal - Ortho - Xylidine, Asymmetrical - Meta - Xylidine Tech. and Para-Xylidine Tech. are available upon request.

• Prevention of Deterioration Abstracts

The National Research Council of the National Academy of Sciences (Prevention of Deterioration Center, Room 204), 2101 Constitution Avenue, Washington, D. C., offers the 'Prevention of Deterioration Abstracts' on a yearly subscription basis. These Abstracts are classified under the following headings: Biological Agents; Electrical and Electronic Equipment; Fungicides and Other Toxic Compounds; Lacquers, Paints and Varnishes; Leather; Lubricants; Metals; Miscellaneous; Optical Instruments and Photographic Equipment; Packaging and Storage; Plastics, Resins, Rubbers, and Waxes; Textiles and Cordage; Wood and Paper. Cross references are included in each issue; author and subject indexes are compiled at the conclusions of each volume. Material for the Abstracts is obtained from journal articles, patents, and unpublished reports from government, university, and industrial research groups both here and abroad.

Approximately 2,000 pages are published a year, in two volumes of six issues each. The individual abstracts are in loose leaf form so that they may be arranged in any manner desired by the individual receiving them. Comments are added to many of the abstracts to correlate relevant information, to evaluate reports, or to make suggestions for further research.

The yearly subscription rate, which includes two sturdy binders and index guides, is currently $37.50. The rate will be $50.00 for requests received after July 1, 1949. All subscriptions run from July 1st to June 30th. Back issues are available from April 1946 when the series was started.

An "Advance List," a monthly bibliography of all the reports received in this field by the Prevention of Deterioration Center is also available for an additional $10.00 per year.

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Hydrosulfite NF—

(Concluded from Page 106)

Zündel's. It is probable that Thesmar did the laboratory work on the hydrosulfite compound, but Schwartz and Baumann may have supervised the work and given him suggestions. At any rate all three felt that they had participated in the work as otherwise they would not all three have amicably signed the sealed deposit with the *Société Industrielle de Mulhouse.*

I think that the reason why they did not apply for a patent was that they hoped to keep the process secret as long as possible. I remember how surprised we were in 1903 when Zündel's first came out with beautiful white and colored discharges on para red, para brown, and direct dyestuffs. We could not imagine how they had been done.

In 1903 Russina, who was the manager of the Eilenburger Kaltundruckerei in Germany, approached the Farbwerke and asked whether they would be interested in the manufacture of a product with which white and colored discharges could be produced on para red, etc. The Farbwerke realized the importance of this subject and sent Mr. V. Gallois, who at that time was the head of their printing department, to see Russina. They carried out some experiments together in Eilenburg and on his return to Hoechst Mr. Gallois reported on the successful results of his experiments and suggested that the Farbwerke make a deal with Russina. The result of this deal was that the Farbwerke were to apply for a German patent in their name and that Russina should receive a royalty based on the sale of this product. This was the usual method of handling similar problems.

I do not know how Russina was in a position to offer the Farbwerke this process and as far as I know the Farbwerke did not think it their business to ask him.

Now Schwartz and Russina were very friendly brothers-in-law and exchanged a lot of information as regards printing. This was quite in order as they were managers of two print works in different countries and therefore did not compete with each other. I do not know whether Schwartz informed Russina, perhaps confidentially about Hydrosulfite N.F., but Schwartz's fellow chemists seemed to think that he did and forced him out of Zündel's.

I did not know that Russina had applied for an American patent. If he did, it seems strange that he should do so. He may, however, have applied for an American patent in preference to a German one in order not to attract the atention of the German print works to this process which he would have done sooner if he had applied in Germany. The American patent would have protected him for a year in the world. After the deal with the Farbwerke there was no reason for an American application and he may have withdrawn it. That is perhaps why Wengraf could not find a trace of it in Washington.

I do not remember the dates of the Farbwerke patents, but it is strange that Haller mentions two, viz., February 23, 1903, which would not be long after the date of the sealed deposit (December 15, 1902), and December 8, 1903.

Cassella and the Farbwerke were always on very friendly terms and interchanged a lot of products. When they discovered that they had both bought the same product but from different sources they settled to put out the product jointly under the names of Hydrosulfite N.F. and Hyraldite A at the same price.

Finally, I should like to point out that these two products were not straight sodium sulfoxylate formaldehyde as Haller states. According to the process then used you got a mixture of equal parts of sodium bisulfite formaldehyde and sodium hydrosulfite formaldehyde. It was only later, I think in 1905, that a method was found for producing the straight sodium sulfoxylate formaldehyde which was twice the strength of the former Hydrosulfite N.F. and which was then put out under the name of Rongalite C, among others.

Proceedings of the
American Association of Textile Chemists and Colorists

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February 7, 1949

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NEW BEDFORD TEXTILE INSTITUTE
GEORGIA SCHOOL OF TECHNOLOGY
CLEMSON COLLEGE
BRADFORD DURFEE TECHNICAL INSTITUTE

BDTI Election Held

THE Bradford Durfee Technical Institute held its second election on December 16, 1948. Edward L. Kelley was elected Chairman, Richard P. Barber, Secretary, and Stanley V. Dubiel, Treasurer.

Respectfully submitted,
RICHARD P. BARBER,
Secretary.

—♦ ♦—

Report, LTI Student Chapter

THE regular monthly meeting of the Lowell Textile Institute Student Chapter was held on Wednesday afternoon, December 8, 1948. At a seminar in the evening Mr. Connoly of Carbide and Carbon Chemicals Corporation spoke on "Plastic Resin Applications in the Textile Industries."

On December 9, the DuPont Company film, "Harnessing the Rainbow," was shown.

Respectfully submitted,
JOAN L. GREGG, *Secretary.*

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Correspondence on Flammability Standards

COMMITTEE CORRESPONDENCE
UNDERWRITERS' LABORATORIES, INC.

December 16, 1948

Mr. Henry F. Herrmann, President
American Association of Textile Chemists & Colorists

Dear Mr. Herrmann:

As Chairman of the Standing Committee on Recommended Commercial Standard for Flammability of Textiles-TS-4733 I have been instructed to express to you and to your Association the sincere appreciation of our Committee for the very valuable contributions already made to the work of our Committee by your membership and especially for the recent offer of your Flammability Committee to continue the study of testing methods and to make available to us the findings resulting from this research work.

As is frequently the case, our Committee is handicapped in furthering its objectives because of lack of funds and facilities for detailed study of some of the problems confronting it. It is only through the cooperation of organizations such as the AATCC that we could hope to bring the work to a satisfactory conclusion and we want you to know that your assistance in this direction is thoroughly appreciated.

Cordially yours,
C. W. RULON,
Chairman.

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

December 23, 1948

Mr. C. W. Rulon, Chairman
Committee Correspondence
Underwriters' Laboratories, Inc.

Dear Mr. Rulon:

In behalf of the administration of the AATCC, Mr. Bonnar, our Chairman of Research, Dr. H. E. Hager, Chairman of the Committee on Flammability of Consumer Textiles and his associates on this committee, I wish to thank you for your expression of appreciation of the work we have done on this subject. This acknowledgment of the important role which our association is playing in the integration of services of interest to producer, merchandiser, the ultimate consumer and protective agencies is very significant.

Sincerely yours,
H. F. HERRMANN,
President.

Research Highlights

NaCl vs. Na_2SO_4—DYEING OF ACID COLORS

An AATCC project recently completed combined a theoretical approach with practical laboratory evaluation and indicated that common salt is interchangeable with Glauber's Salt. Practical mill application is now going on.

CALENDAR

WESTERN NEW ENGLAND SECTION
Meetings: February 25, April 8, May 20.

NEW YORK SECTION
Meetings: March 4, April 1, May 6.
Outing: June 17.

PHILADELPHIA SECTION
Meetings: March 11, April 15, May 20, September 16, November 11 (Kugler's, Philadelphia).
Outing: June 10.

PACIFIC COAST SECTION
Meeting: February 11 (Mona Lisa Restaurant, Los Angeles, Calif., "The New Look in Textiles," Raymond W. Jacoby).

PIEDMONT SECTION
Meetings: April 2 (Robert E. Lee Hotel, Winston-Salem, N. C.), June 24, 25, 26 (Ocean Forest Hotel, Myrtle Beach, S. C.), November 5 (Charlotte Hotel, Charlotte, N. C.)

HUDSON-MOHAWK SECTION
Meetings: March 18, May 20, September 16, November 18.
Outing: June 17.

MID-WEST SECTION
Meeting: February 26 (Bismarck Hotel, Chicago).

COUNCIL
Meeting: March 25 (Hotel New Yorker, New York).

RESEARCH COMMITTEE
Meeting: March 25 (Hotel New Yorker, New York).

NATIONAL CONVENTIONS
1949: October 13 to 15, Chalfonte-Haddon Hall, Atlantic City.
1950: October 19 to 21, Statler, Boston.

EMPLOYMENT REGISTER

This column is open for four insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.

48-24

Education: Expects B.S. in textile chemistry, Clemson College, 1949.
Experience: Two years stockman and metal worker; five years U. S. Navy. Officer in various student organizations.
Age 30; married; industrial and college references; N. E. preferred, but will go elsewhere; interested in textile resin application research. 1-10, 2-7, 3-7, 4-8

48-25

Education: R. I. School of Design, evenings.
Experience: 24 years, 10 as Boss Dyer, with same company, recently liquidated; varied experience, in particular warp, skein and package dyeing, and bleaching.
Age 53; married; N.E. preferred, as dyeing supervisor or demonstrator. 1-10, 1-24, 2-7, 2-21

48-26

Education: Textile School.
Experience: 31 years overseer and superintendent of cotton bleaching, dyeing and finishing; retired at age limit.
Age 66; in excellent health; married; interested in work anywhere along Atlantic coast. 1-24, 2-7, 2-21, 3-7

49-1

Education: B.T.C., Lowell Textile Institute.
Experience: Laboratory technician, cost research, quality control, following army service.
Age 26; married; references. 1-24, 2-7, 2-21, 3-7

49-2

Education: High school, with college evening courses in chemical engineering.
Experience: Chemist, U.S. Navy and dye house.
Age 27; married; vicinity of New York City preferred. 1-24, 2-7, 2-21, 3-7

49-3

Education: Textile High School.
Experience: U. S. Army, clerk, one year textile colorist.
Age 24; married; reference. 2-7, 2-21, 3-7, 3-21

Testing and Auxiliaries Group Meeting—

THE EFFECT OF TEMPERATURES ON FINISHING COMPOUNDS*

ARTHUR H. NOBLE, JR.

Plant Manager, Charlotte Division, Arnold, Hoffman & Co., Inc.

THE use of various sulfated oils, tallows, synthetic fatty amide softeners and weighters always raises in the finisher's mind the following questions:

1. Will they yellow the cloth during drying or subsequent storage?
2. Will fabric in storage or at the plant develop rancid odor?
3. Is my equipment suitable for the type of finish to be used?

A search of available literature revealed no comparative study of various finishes indicating the limits within which any particular product could be safely used. No chart is available from which a finisher can select a sulfated oil, tallow or synthetic softener to perform the job in mind. Several factors contribute to successful use of a product or failure, such as pH, concentration, type of use and equipment on which to be used. Our Application Laboratories have been studying various finishing compounds for data of use to the average finisher. The study includes sulfated oils and sulfated tallows, stearic acid softeners, fatty amide and fatty carbamide substantive softeners and weighters. No work has been completed to date on resins used in finishing operations, in the belief that this group should be studied as an individual unit.

The use of sulfated oils as softeners is old, and increasing knowledge of these oils since their introduction in 1831 by Fremy *(1)* has resulted in better finishing compounds. Fremy studied the effect of sulfuric acid on olive oil, oleic acid and almond oil, but Runge was the first to prepare a sulfated olive oil in 1834. This was used in dyeing calico red. In 1874, Kochlin introduced the use of an oil preparation on piece goods before steaming. In 1911, there was published in Germany by F. Erban *(2)* a comparison of the sulfation and saponification products of castor, rape, fish and coconut oil, as applied to textiles during dyeing and finishing.

In the period between 1911 and 1935, new methods of sulfation produced better oils, with increased stability toward rancidity and heat. In 1936 to 1938, substantive softeners *(3)* were introduced which, being wash-resistant, rapidly replaced stearic acid softeners and certain sulfated oils as pure finishes. This type of compound, however, does not impart body or added weight, and recourse must be made to products known as weighters, in conjunction with softeners, to attain this type of finish.

Weighters are familiar to everyone. Earlier uses of weighters were in finishing of silks, where it was not uncommon to load cloth upwards of 200% by weight with tin salts. That this had adverse effect on the fabric was considered secondary, until the Federal Trade Commission ruled that silk must contain not over 10% foreign matter, except for blacks, limited to 15%.

Today the more commonly used weighters are epsom salts, Glauber's salts, urea, urea and salt mixtures, urea and starch mixtures, sugars and urea derivatives. These should not be confused with fillers, such as clays. Salts and sugars are objectionable, due to dusting and scorching properties, respectively.

For simplicity, the compounds studied have been divided into four groups:

1. Sulfated Oils.
2. Sulfated Tallows and Fatty Acid Softeners.
3. Synthetic Substantive Softeners.
4. Weighters.

Representative samples of the sulfated oils, tallows and synthetic softeners for study were submitted by various companies, and the results obtained are here presented in chart form.

Three types of tests were developed, for comparative study of the effect of temperature on various oils, softeners and weighters, namely:

1. Accelerated ageing or drying.
2. Rancidity.
3. Scorch.

The cloth used for this work was boiled-off and bleached 80 x 80 plain-weave cotton. To eliminate as many variables as possible, distilled water was used for preparing all solutions.

The sulfated oils and softeners (anionic, cationic, tallow and stearic acid types) were applied to the bleached cotton cloth in 1%, 3% and 5% solutions. The weighters were applied in 4%, 8%, 12% and 24%. solutions. In all cases the pad liquor was maintained at 120° F. Sufficient cloth was processed at one time for all subsequent testing.

The padder was an H. W. Butterworth three-roll (rubber) pneumatic laboratory model, with 59 lbs. maximum pressure attainable on the rolls. Samples were padded through the liquor at 120° F. and given a double nip, the pressure being regulated to give a wet pick-up of 80% to 90%. The samples were dried without tension in a circulating air drying oven at 200° F.

The procedures for the three tests mentioned were as follows:

1. ACCELERATED AGEING TESTS.—These tests were conducted in an electrically heated, thermostatically controlled, forced draft, constant temperature oven manufactured by the American Instrument Company of Silver Springs, Maryland.

Samples with each finish were subjected respectively to:

Five Minutes at 300° F.
Fifteen Minutes at 300° F.
Five Minutes at 350° F.
Fifteen Minutes at 350° F.

The temperatures and times were chosen as representing the range of most practical and most drastic conditions encountered in plant drying operations.

Groupings of impregnated samples previously air dried at 200° F. were placed simultaneously in the oven, according to their respective temperature and time period, to insure comparative results. This was accomplished by a port-

* Presented at Testing and Auxiliaries Group Meeting, Augusta National Convention, October 22, 1948.

TABLE I

A - 5 minutes @ 300° F.
B - 5 minutes @ 350° F.
C -15 minutes @ 300° F.
D -15 minutes @ 350° F.

ACCELERATED OVEN AGEING TESTS

PRODUCT	SOLUTION	DISCOLORATION			
		Nil	Slight	Distinct	Heavy
Blank - Boiled Off and Bleached 80/80 Cotton	A B C D				

TABLE II

A - 5 minutes @ 300° F.
B - 5 minutes @ 350° F.
C -15 minutes @ 300° F.
D -15 minutes @ 350° F.

ACCELERATED OVEN AGEING TESTS
Sulfonated Olive Oil Substitutes

PRODUCT	SOLUTION	DISCOLORATION			
		Nil	Slight	Distinct	Heavy
Sulfonated Olive Oil Substitute	1% A B C D				
PRODUCT I	3% A B C D				
pH 9.0	5% A B C D				
Sulfonated Olive Oil Substitute	1% A B C D				
PRODUCT I	3% A B C D				
pH 6.0	5% A B C D				
Sulfonated Olive Oil Substitute	1% A B C D				
PRODUCT II	3% A B C D				
	5% A B C D				
Sulfonated Olive Oil Substitute	1% A B C D				
PRODUCT III	3% A B C D				
	5% A B C D				

TABLE III

A - 5 minutes @ 300° F.
B - 5 minutes @ 350° F.
C -15 minutes @ 300° F.
D -15 minutes @ 350° F.

ACCELERATED OVEN AGEING TESTS
Sulfonated Olive Oil Substitutes

PRODUCT	SOLUTION	DISCOLORATION			
		Nil	Slight	Distinct	Heavy
Sulfonated Olive Oil Substitute	1% A B C D				
PRODUCT IV	3% A B C D				
pH 9.0	5% A B C D				
Sulfonated Olive Oil Substitute	1% A B C D				
PRODUCT IV	3% A B C D				
pH 6.0	5% A B C D				
Sulfonated Olive Oil Substitute	1% A B C D				
PRODUCT V	3% A B C D				
pH 6.0	5% A B C D				

TABLE IV

A - 5 minutes @ 300° F.
B - 5 minutes @ 350° F.
C -15 minutes @ 300° F.
D -15 minutes @ 350° F.

ACCELERATED AGEING TESTS
Sulfonated Castor Oils

PRODUCT	SOLUTION	DISCOLORATION			
		Nil	Slight	Distinct	Heavy
Sulfonated Castor Oil	1% A B C D				
PRODUCT I	3% A B C D				
pH 9.0	5% A B C D				
Sulfonated Castor Oil	1% A B C D				
PRODUCT I	3% A B C D				
pH 6.0	5% A B C D				
Sulfonated Castor Oil	1% A B C D				
PRODUCT II	3% A B C D				
	5% A B C D				
Sulfonated Castor Oil	1% A B C D				
PRODUCT III	3% A B C D				
	5% A B C D				

TABLE V

A - 5 minutes @ 300° F.
B - 5 minutes @ 350° F.
C -15 minutes @ 300° F.
D -15 minutes @ 350° F.

ACCELERATED OVEN AGEING TESTS
Sulfonated Soya Bean Oils

PRODUCT	SOLUTION	DISCOLORATION			
		Nil	Slight	Distinct	Heavy
Sulfonated Soya Bean Oil	1% A B C D				
PRODUCT I	3% A B C D				
pH 9.0	5% A B C D				
Sulfonated Soya Bean Oil	1% A B C D				
PRODUCT I	3% A B C D				
pH 6.0	5% A B C D				

TABLE VI

A - 5 minutes @ 300° F.
B - 5 minutes @ 350° F.
C -15 minutes @ 300° F.
D -15 minutes @ 350° F.

ACCELERATED OVEN AGEING TESTS
Anionic Substantive Softeners

PRODUCT	SOLUTION	DISCOLORATION			
		Nil	Slight	Distinct	Heavy
Anionic Softener	1% A B C D				
PRODUCT I*	3% A B C D				
	5% A B C D				
Anionic Softener	1% A B C D				
PRODUCT II*	3% A B C D				
	5% A B C D				

*Patent # 2,344,259

TABLE VII

A - 5 minutes @ 300° F.
B - 5 minutes @ 350° F.
C -15 minutes @ 300° F.
D -15 minutes @ 350° F.

ACCELERATED OVEN AGEING TESTS
Cationic Softeners

PRODUCT	SOLUTION	DISCOLORATION			
		Nil	Slight	Distinct	Heavy
Cationic Softener PRODUCT I*	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Cationic Softener PRODUCT II	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Cationic Softener PRODUCT III	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Cationic Softener PRODUCT IV	1%	A B C D			
	3%	A B C D			
	5%	A B C D			

*Patent # 2,804,113
2,804,369

TABLE IX

A - 5 minutes @ 300° F.
B - 5 minutes @ 350° F.
C -15 minutes @ 300° F.
D -15 minutes @ 350° F.

ACCELERATED OVEN AGEING TESTS
Weighters

PRODUCT	SOLUTION	DISCOLORATION			
		Nil	Slight	Distinct	Heavy
Epsom Salts PRODUCT I	4%	A B C D			
	12%	A B C D			
	24%	A B C D			
Sugar Weighter PRODUCT I	4%	A B C D			
	12%	A B C D			
	24%	A B C D			
Sugar Weighter PRODUCT II	4%	A B C D			
	12%	A B C D			
	24%	A B C D			
Sugar Weighter PRODUCT III	4%	A B C D			
	12%	A B C D			
	24%	A B C D			

A - 5 minutes @ 300° F.
B - 5 minutes @ 350° F.
C - 15 minutes @ 300° F
D - 15 minutes @ 350° F

TABLE VIII

ACCELERATED OVEN AGEING TESTS
Sulfonated Tallow Softeners
Stearic Acid Softener

PRODUCT	SOLUTION	DISCOLORATION			
		Nil	Slight	Distinct	Heavy
Sulfonated Tallow Softener PRODUCT I	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Sulfonated Tallow Softener PRODUCT II	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Sulfonated Tallow Softener PRODUCT III	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Sulfonated Tallow Softener PRODUCT IV	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Stearic Acid Softener PRODUCT V	1%	A B C D			
	3%	A B C D			
	5%	A B C D			

TABLE X

A - 5 minutes @ 300° F.
B - 5 minutes @ 350° F.
C -15 minutes @ 300° F.
D -15 minutes @ 350° F.

ACCELERATED OVEN AGEING TESTS
Weighters

PRODUCT	SOLUTION	DISCOLORATION			
		Nil	Slight	Distinct	Heavy
Urea Mixtures PRODUCT I	4%	A B C D			
	12%	A B C D			
	24%	A B C D			
Urea Mixtures PRODUCT II	4%	A B C D			
	12%	A B C D			
	24%	A B C D			
Urea Mixtures PRODUCT III	4%	A B C D			
	12%	A B C D			
	24%	A B C D			
Urea Derivatives *	4%	A B C D			
	12%	A B C D			
	24%	A B C D			

*Patent # 2,281,599

able rack easily placed in, or withdrawn from the oven. Strings were attached to the uppermost cross-pieces like a clothesline and from these were hung the samples. The drying oven was brought to the required drying temperature, plus 10° F. The rack with its suspended samples was quickly placed within the dryer, the door was closed, and the drying was conducted for the required time. The 10° F. additional was to compensate for temperature loss in opening the door to insert the sample rack.

2. RANCIDITY TESTS.—For these tests cuttings were put into individual, tightly closed jars, and kept fourteen days at 70° C., or 158° F. Sniff tests for odor were made at four-day intervals. Final evaluations are based on results from the samples at the end of the fourteen days.

3. SCORCH TESTS.—Scorch tests were made on a machine developed in the laboratories of the American Viscose Corporation and Cluett, Peabody & Company for determining damage to rayon through retention of chlorine by stabilizing resin finishes. This machine has been further developed and is available from Alfred Suter, Inc., New York City. It is a small box arrangement, electrically heated and thermostatically controlled to plus or minus 1°. A screw adjustment on the side of the instrument permits a testing range from 250° to 500°. Heat supplied by the coils within the box is transmitted to a chromium-plated heating surface. A metal block weighing approximately 600 grams with a hole for insertion of a thermometer, is placed on the chromium-plated heating surface. The instrument is then adjusted to the desired temperature by the screw. Signal lights on the side of the instrument indicate when the heating elements have raised the block temperature to the desired setting.

With the machine at the desired temperature, samples are placed on the chromium-plated heating surface; the metal block is placed immediately on top, and the samples are subjected to thirty seconds exposure. In our tests all samples were checked in the range from 250° F. to 400° F., at intervals of 25° F.

Our tables are based on readings at 50° F. intervals, because of the very small differences found at 25° F. intervals. Check tests on the above three procedures indicated good reproducibility, and though all tests were carried out in the laboratory, it is felt that there is definite correlation with plant experience.

In considering results, each group, as indicated above, was carefully examined with respect to all three testing procedures. In all cases, untreated swatches of 80 x 80 bleached and desized cotton cloth were run as check tests. In the scorch test, untreated cloth showed no discoloration until exposed for thirty seconds at 400° F. This was taken as the standard for comparison. In the accelerated ageing test, results on the untreated cloth were negative up to a fifteen-minute exposure at 350° F., where slight yellowing occurred. The rancidity test was negative on untreated fabric.

Group 1 (Sulfated Oils) includes olive oil substitutes, castor oil and soya bean oil at pH of both 6.0 and 9.0.

Olive oil substitutes, offered today as finishing oils, are as a class excellent, as evaluated by the above three methods. Under all practical conditions in the mill, one should expect no discoloration, no odor development, and freedom from scorching troubles. The pH does not seem to affect materially the behavior of these sulfated oils. At high concentrations, and long exposures at elevated temperatures, yellowing is noticed; but these conditions would be difficult to find in any practical process. Though any of the olive oil substitutes alone shows positive discoloration after fifteen minutes exposure at 350° F. In the scorch test, no positive results appear under 400° F. Longer exposures at low temperatures do not affect results adversely. Temperature and concentration seem the main factors in behavior of this group of oils with regard to rancidity and scorch resistance.

In the group of castor oils studied, at ordinary drying temperatures between 240° and 280° F. no yellowing occurs. As temperature, time and concentration increase, yellowing appears. At 300° F., for five minutes, positive yellowing occurs at concentrations of 3% to 5%. The pH affects sulfated castor oil. At pH 9.0, greater discoloration is noticed than at pH 6.0, although at pH 6.0 yellowing is sufficient to require careful use of the product. In no case should sulfated castor oils be used when high temperature drying operations are to be encountered. Rancidity tests on sulfated castor oils show differences between the various products studied, indicating that method of sulfation has marked effect on the finished oil. All three products studied became yellow after fourteen days' exposure at 158° F., but Product #I to a lesser degree and with less odor. Products II and III did not turn rancid, but possessed a strong castor odor. Positive scorching was observed at 300° F. Sulfated castor oils adjusted to pH 9.0 showed greater discoloration under the above tests than those adjusted to pH 6.0. In general, sulfated castor oil should be avoided as a finishing oil.

Soya bean oil is very similar to castor in its properties, as evaluated by the three methods. Yellowing in the accelerated ageing test is less than with castor, but soya bean oil develops more odor. The resistance of soya bean oil to scorching is equal to that of castor oil.

Group #2 (Sulfated Tallow and Fatty Acid Softeners) includes low and high sulfated tallows and stearic acid softeners. The sulfated tallows included a washed type, also one merely sulfated and neutralized with sodium hydroxide, with the salt left in the finished product. All products evaluated for scorch resistance by the Suter method were classified as highly resistant to exposures of thirty seconds at temperatures from 325° F. to 350° F. Under the standard tests, all the tallows gave good results, showing that rancidity is not materially affected by the type of sulfation. This group of softeners gave good resistance when exposed to drying temperatures below 300° F. for five to fifteen minutes. Above 300° F. yellowing became pronounced. The time was longer than normally encountered in practice.

Group #3, (Synthetic Substantive Softeners) includes both cationic and anionic types.

Cationic substantive softeners in general do not have as good resistance to heat as do the anionics studied. Up to drying temperatures of 300° F., only slight yellowing is observed, but at 340° F. to 350° F. positive results are obtained. With the exception of Product II, none of the cationic softeners developed odor in the rancidity test. Product II developed a pronounced burnt sugar odor. In our scorch test, Product III showed positive results at 300° F., while all developed color at 350° F.

Anionic substantive softeners *(3)* show very good resistance to drying temperature, rancidity and scorch tests. In oven drying and rancidity tests, Product II equalled the untreated fabric. Scorch tests show that from 375° to 400° F., slight yellowing does occur, but both products would be satisfactory at ordinary curing temperatures. For general purposes and when excessive heat must be used, the anionic type is preferred to the cationic.

Group #4 (Weighters) includes epsom salts, urea, urea and salt mixtures, urea derivatives and sugars.

Magnesium sulfate, epsom salts, gave negative results under all three tests and can be used without fear of yellowing. Its chief disadvantage is that it dusts readily from the fabric. The entire group of sugar weighters, Products I, II and III, developed no odor in the rancidity test, either under air drying or scorch test, but have very low resistance to

TABLE XI

RANCIDITY TRIALS
EVALUATION OF ODORS
(15 Days at 70° C.)

	WEIGHTERS		
Epsom Salts	4%	12%	24%
Product I	Nil	Nil	Nil
Sugar Weighters			
Product I	Nil	Nil	Nil
Product II	Nil	Nil	Nil
Product III	Nil	Nil	Nil
Urea Derivative			
Product I*	Nil	Nil	Very Slight
Urea Mixtures			
Product I	Nil	Nil	Nil
Product II	Nil	Nil	Very Slight
Product III	Slight Ammonia	Slight Ammonia	Slight Ammonia

*Patent #2,281,599

TABLE XII

RANCIDITY TRIALS
EVALUATION OF ODORS
(15 Days at 70° C.)

		1%	3%	5%
Sulfonated Castor Oil				
Product I	pH 9.0	Nil	Nil	Nil
	pH 6.0	Very Slight	Very Slight	Very Slight
Product II	pH 6.0	Sl. Castor Oil	Sl. Castor Oil	Sl. Castor Oil
Product III	pH 6.0	Slight	Slight	Sweet
Sulfonated Olive Oil Substitutes				
Product I	pH 9.0	Nil	Nil	Slight
	pH 6.0	Very Slight	Very Slight	Sl. "Sickish"
Product II	pH 9.0	Nil	Nil	Very Slight
	pH 6.0	Nil	Nil	Sl. "Sickish"
Product III	pH 6.0	Slight	Slight	Slight Medium
Product IV	pH 6.0	Nil	Nil	Nil
Product V	pH 6.0	Slight	Slight Fatty	Slight Fatty
Sulfonated Soya Bean Oil				
Product I	pH 9.0	Very Slight	Very Slight	Very Slight
	pH 6.0	Nil	Very Slight	Slight
Anionic Softeners				
Product I*	pH 6.0	Nil	Nil	Nil
Product II*	pH 6.0	Nil	Nil	Sl. Sweet
Cationic Softeners				
Product I**	pH 6.0	Nil	Nil	Sl. "Sickish"
Product II	pH 6.0	Burnt Sugar	Burnt Sugar	Burnt Sugar
Product III	pH 6.0	Nil	Nil	Nil
Product IV	pH 6.0	Nil	Nil	Very Slight
Sulfonated Tallow Softeners				
Product I	pH 6.0	Nil	Slight Fatty	Slight Fatty
Product II	pH 6.0	Very Slight	Very Slight	Very Sl. "Sickish"
Product III	pH 6.0	Slight	Sl. Sweet	Fairly Strong
Product IV	pH 6.0	Nil	Nil	Nil
Stearic Acid Softener				
Product I	pH 6.0	Nil	Very Slight	Sl. Fatty

*Patent #2,344,259
**Patent #2,304,113
#2,304,369

A - 250° F.
B - 300° F.
C - 350° F.
D - 400° F.

TABLE XIII

SCORCH TRIALS
Thirty Seconds on Suter Accelerated Ageing Tester

PRODUCT	SOLUTION	SCORCH TENDENCIES			
		Nil	Slight	Distinct	Heavy
Blank Sample	A B C D	-- -- ------ ----------			

A - 250° F.
B - 300° F.
C - 350° F.
D - 400° F.

TABLE XIV

SCORCH TRIALS
Thirty Seconds on Suter Accelerated Ageing Tester

PRODUCT	SOLUTION	SCORCH TENDENCIES			
		Nil	Slight	Distinct	Heavy
Sulfonated Olive Oil Substitute PRODUCT I pH 9.0	1%	A -- B -- C ---------- D ----------			
	3%	A -- B --- C ---------- D ----------			
	5%	A -- B --- C ---------- D ----------			
Sulfonated Olive Oil Substitute PRODUCT I pH 6.0	1%	A -- B -- C --------- D ----------			
	3%	A -- B --- C ---------- D ----------			
	5%	A -- B --- C ---------- D ----------			
Sulfonated Olive Oil Substitute PRODUCT II	1%	A -- B --- C ---------- D ----------			
	3%	A -- B --- C ---------- D ----------			
	5%	A ---- B ---- C ---------- D ----------			
Sulfonated Olive Oil Substitute PRODUCT III	1%	A -- B --- C ---------- D ----------			
	3%	A -- B --- C ---------- D ----------			
	5%	A ----- B ----- C ---------- D ----------			

A - 250° F.
B - 300° F.
C - 350° F.
D - 400° F.

TABLE XV

SCORCH TRIALS
Thirty Seconds on Suter Accelerated Ageing Tester

PRODUCT	SOLUTION	SCORCH TENDENCIES			
		Nil	Slight	Distinct	Heavy
Sulfonated Olive Oil Substitute PRODUCT IV pH 9.0	1%	A -- B -- C ---------- D ----------			
	3%	A -- B -- C ---------- D ----------			
	5%	A -- B ----- C ---------- D ----------			
Sulfonated Olive Oil Substitute PRODUCT IV pH 6.0	1%	A -- B --- C ---------- D ----------			
	3%	A -- B --- C ---------- D ----------			
	5%	A -- B --- C ---------- D ----------			
Sulfonated Olive Oil Substitute PRODUCT V	1%	A -- B --- C ---------- D ----------			
	3%	A -- B --- C ---------- D ----------			
	5%	A -- B ------- C ---------- D ----------			

A - 250° F.
B - 300° F.
C - 350° F.
D - 400° F.

TABLE XVI

SCORCH TRIALS
Thirty Seconds on Suter Accelerated Ageing Tester

PRODUCT	SOLUTION	SCORCH TENDENCIES			
		Nil	Slight	Distinct	Heavy
Sulfonated Castor Oil PRODUCT I pH 9.0	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Sulfonated Castor Oil PRODUCT I pH 6.0	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Sulfonated Castor Oil PRODUCT II	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Sulfonated Castor Oil PRODUCT III	1%	A B C D			
	3%	A B C D			
	5%	A B C D			

A - 250° F.
B - 300° F.
C - 350° F.
D - 400° F.

TABLE XVII

SCORCH TRIALS
Thirty Seconds on Suter Accelerated Ageing Tester

PRODUCT	SOLUTION	SCORCH TENDENCIES			
		Nil	Slight	Distinct	Heavy
Sulfonated Soya Bean Oil PRODUCT I pH 9.0	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Sulfonated Soya Bean Oil PRODUCT I pH 6.0	1%	A B C D			
	3%	A B C D			
	5%	A B C D			

A - 250° F.
B - 300° F.
C - 350° F.
D - 400° F.

TABLE XVIII

SCORCH TRIALS
Thirty Seconds on Suter Accelerated Ageing Tester

PRODUCT	SOLUTION	SCORCH TENDENCIES			
		Nil	Slight	Distinct	Heavy
Anionic Softener PRODUCT I*	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Anionic Softener PRODUCT II*	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
*Patent # 2,344,259					

A - 250° F.
B - 300° F.
C - 350° F.
D - 400° F.

TABLE XIX

SCORCH TRIALS
Thirty Seconds on Suter Accelerated Ageing Tester

PRODUCT	SOLUTION	SCORCH TENDENCIES			
		Nil	Slight	Distinct	Heavy
Cationic Softener PRODUCT I*	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Cationic Softener PRODUCT II	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Cationic Softener PRODUCT III	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Cationic Softener PRODUCT IV	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
*Patent #2,304,113 #2,304,369					

A - 250° F.
B - 300° F.
C - 350° F.
D - 400° F.

TABLE XX

SCORCH TRIALS
Thirty Seconds on Suter Accelerated Ageing Tester

PRODUCT	SOLUTION	SCORCH TENDENCIES			
		Nil	Slight	Distinct	Heavy
Sulfonated Tallow PRODUCT I	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Sulfonated Tallow PRODUCT II	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Sulfonated Tallow PRODUCT III	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Sulfonated Tallow PRODUCT IV	1%	A B C D			
	3%	A B C D			
	5%	A B C D			
Stearic Acid Softener PRODUCT V	1%	A B C D			
	3%	A B C D			
	5%	A B C D			

A - 250° F.
B - 300° F.
C - 350° F.
D -400° F.

TABLE XXI

SCORCH TRIALS
Thirty Seconds on Suter Accelerated Ageing Tests

PRODUCT	SOLUTION	SCORCH TENDENCIES			
		Nil	Slight	Distinct	Heavy
Epsom Salts	4%	A, B, C, D			
	12%	A, B, C, D			
	24%	A, B, C, D			
Sugar Weighter PRODUCT I	4%	A, B, C, D			
	12%	A, B, C, D			
	24%	A, B, C, D			
Sugar Weighter PRODUCT II	4%	A, B, C, D			
	12%	A, B, C, D			
	24%	A, B, C, D			
Sugar Weighter PRODUCT III	4%	A, B, C, D			
	12%	A, B, C, D			
	24%	A, B, C, D			

A - 250° F.
B - 300° F.
C - 350° F.
D - 400° F.

TABLE XXII

SCORCH TRIALS
Thirty Seconds on Suter Accelerated Ageing Tester

PRODUCT	SOLUTION	SCORCH TENDENCIES			
		Nil	Slight	Distinct	Heavy
Urea Mixture PRODUCT I	4%	A, B, C, D			
	12%	A, B, C, D			
	24%	A, B, C, D			
Urea Mixture PRODUCT II	4%	A, B, C, D			
	12%	A, B, C, D			
	24%	A, B, C, D			
Urea Mixture PRODUCT III	4%	A, B, C, D			
	12%	A, B, C, D			
	24%	A, B, C, D			
Urea Derivative PRODUCT IV*	4%	A, B, C, D			
	12%	A, B, C, D			
	24%	A, B, C, D			

*Patent #2,281,599

testing, where the cloth is in intimate contact with metal, just as on a dry can. Extremely yellowing is noticed from 300° F. up. Below that, discoloration is in direct proportion to time and concentration. Sugar weighters should be used very cautiously, and in their use, excessive heat or long contact at any temperature should be avoided in subsequent finishing operations.

Urea weighters proved the most interesting of this group. Samples I, II and III, which are urea or urea mixtures, gave no discoloration up to 375° F., and so can be safely used under normal conditions. In the rancidity tests, no rancid odors were obtained, but when samples were placed in closed bottles for fourteen days at 70° C., every one showed decomposition, evidenced by ammonia fumes. While the test represents but a laboratory method of accelerated ageing, it indicates possibility of ammonia being liberated either in processing or during long storage of the cloth in a warm room. We have no evidence of this occurring in plant practice. Sample IV, though a urea derivative *(4)*, was unique in that it showed no development of ammonia after fourteen days at 70° C. It also had higher resistance to the heat encountered in air drying and scorch tests.

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(3) E. D. McLeod, "Anionic Substantive Softeners", American Dyestuff Reporter, January 12, 1948.
(4) U. S. Patent No. 2,281,599.

Acknowledgment

We wish to express our appreciation to the following companies for the material contributed by them, and used in this study:

American Cyanamid Corporation.
Jacques Wolf and Company.

Lapel Buttons for AATCC Members may be purchased from the National Secretary for $2.00 each

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RECENT RESEARCH ON COTTON PROPERTIES AT THE SOUTHERN REGIONAL RESEARCH LABORATORY[1, 2]

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THE subject first assigned me was very broad, so broad, in fact, that neither my own capabilities nor the allotted time would have been sufficient for complete coverage. I shall therefore limit discussion almost entirely to work within my own organization, the Southern Regional Research Laboratory.

I must set other limitations as well. An infinite number of properties which might be considered. For convenience, I shall use a list of 31 properties given by M. K. Horne, Jr., in a committee report to the 80th Congress, on the competitive position of cotton in major end-use markets. I have arranged Mr. Horne's listed properties rather arbitrarily in the following tables. After running through these, I shall go back and discuss in more detail the research aimed at improving individual properties.

Those in the first table are being, or have recently been, investigated at the Southern Regional Research Laboratory. Our investigations are not always aimed at direct improvement of the property. In some cases we must first devise means for measuring the property or the degree of its improvement. In other cases we look for basic data, or the fundamental theory underlying the particular property under consideration. A third type of research consists of direct application of basic facts and theory to property improvement. I have indicated which type of work has been done on each property.

In addition to the properties in Table I, there are several others not objects of direct investigation in our work, about which we have derived useful information in the course of other work. These are shown in Table II. Very often it happens that improvements in a property may be produced incidentally in work having a quite different purpose. A couple of the properties in this second list, absorbency and adhesive qualities, are also subjects of direct study, and therefore appear in Table I.

In these first two tables I have referred only to work in New Orleans. This includes both research under our regular appropriation, and that performed under the Research and Marketing Act. In addition to this, a good deal of work for improving cotton properties is carried on outside by contract under the Research and Marketing Act. Table III shows such properties. Here you will notice, reappearing, three subjects shown in previous tables. All three, however, elasticity, water-repellency, and tensile strength, are so important that the individual lines of regular and contract work should not conflict.

To complete the picture, I now give in Table IV those properties, of the 31 listed by Mr. Horne, which have not been subjects of our own organization's research. In some cases this has been due to urgency of other problems. In others we have felt that ample research is being done by other groups.

I should now like to return to the properties listed in the first table and discuss some of our research on these. The first five are particularly important in the tire cord field, so we found it desirable to give attention to the testing

TABLE I

	Evaluation and Testing	*Basic Theory*	*Direct Improvement*
Tensile Strength	x	x	x
Flex Life	x	x	x
Elongation	x		x
Elasticity	x	x	x
Adhesive Qualities	x		
Crease Resistance	x	x	x
Resistance to Weathering	x	x	x
Mildew Resistance	x		x
Resistance to Chemicals		x	
Water Repellency	x	x	x
Absorbency	x	x	x
Resistance to Fire	x	x	x
Warmth			x
Fast Dyes		x	x

Properties covered directly at Southern Regional Research Laboratory.

TABLE II

	Evaluation and Testing	*Basic Theory*	*Direct Improvement*
Resistance to Abrasion	x		x
Resiliency	x		x
Dimensional Stability	x		
Luster			x
Linting			x
Resistance to Stains			x
Insulating Properties			x
Resistance to Wind			x
Permanent Crispness			x
Absorbency			x
Adhesive Qualities			x

Properties incidentally improved in Southern Regional Research Laboratory studies.

[1] Certain phases of this research were carried on under the Research and Marketing Act of 1946.
[2] Presented at General Technical Meeting, Cotton Symposium, Augusta National Convention, October 22, 1948.
[3] One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

TABLE III

	Evaluation and Testing	Basic Theory	Direct Improvement
Resistance to soil	x	x	x
Draping Qualities	x	x	x
Elasticity	x	x	x
Water Repellency		x	x
Slipperiness and Resistance to Clinging	x		
Tensile Strength	x		

Properties covered outside by major Research and Marketing Act work.

TABLE IV

	Evaluation and Testing	Basic Theory	Direct Improvement
Quick Drying			
Soft Colors			
Vivid Prints			
Coolness			
Sheerness			

Properties not studied either by the Southern Regional Research Laboratory or by contract.

and evaluation of all five, and to gathering fundamental data on elasticity, flex life, and tensile strength. Only in the case of adhesive qualities did we judge the desirability of improvement insufficient to justify an extended program.

I believe the property most frequently measured on cotton products is breaking strength, which may be measured in a variety of ways and under a variety of conditions. On tire cord, determination under standard conditions of 70° F. and 65% relative humidity is by no means adequate, for we are interested in improving dry and hot strength also.

We have therefore studied means of doing this. We find it can be accomplished in the laboratory—and I should like to emphasize that some of this work is still in the laboratory stage—by treatment with liquid ammonia or amines, or by a special type of mercerizing treatment combined with stretching; producing cords of high strength at high temperatures or under the "bone-dry" test.

We have also tried to improve the strength of cord under standard conditions. In this connection we are making a detailed determination of the effect of construction, twist, and conditions of stretching upon strength and other physical properties of the cord. We are collecting a great deal of fundamental data on relations between strength, elongation, length, and other physical properties of the individual fibers used in the construction of experimental cords. We made use of this in choice of a standard control cord for further experimentation.

It is well known that the tensile strength of cords can be improved and their elongation reduced to a more desirable value, by the use of stretching processes. Like other organizations interested in improving cords, we have been and still are investigating the effect of various wetting agents, plasticizers and resins, as well as the effect of temperature during treatment. We have developed a stretching device which greatly improves uniformity of the resulting cord. It operates under constant tension, not under constant elongation as do the usual stretching devices. In all of this research care has been taken, of course, not to reduce the elongation below values desired by tire manfacturers.

Coming to the flex fatigue of cords, the question of measurement is very important. Yet there is no generally accepted method for determining this property. It is not exaggerating greatly to say that each laboratory has developed its own fatigue tester, and that no two measure exactly the same thing. A comparative study of several of these testers was made by Committee D-13 of the ASTM in 1940, on rayon tire cord. The result was that none of the instruments was recommended as a standard, though any of them might serve to screen good from bad cords. Two testers developed later at the Southern Regional Laboratory have been compared with these machines, showing good correlation with some of them. Both of our tests represent bending action. In one instrument the cord is wrapped and unwrapped around a ¼-inch steel rod, in such manner that tension applied to the cord is constant. In the other, the cord is fastened between three sets of pulleys, as shown in Figure 1, under a fixed load. The upper and lower pulleys are fixed, with the middle set moving alternately right and left 1 inch to furnish the flexing cycle. Both instruments are equipped to operate under various temperatures, and in the second humidity also may be controlled. Both instruments have been helpful in making preliminary screening tests.

Many of the treatments mentioned as increasing tensile strength have improved flex fatigue as well. For instance, the best treatment for improving flex fatigue at elevated temperatures seems to be mercerization under proper conditions. Fatigue tests at low temperatures, especially on the instrument with the ¼-inch bend, show greatly improved flex fatigue on cord treated with small amounts of lubricants to reduce friction between fibers. At high temperatures this effect is diminished, perhaps because the lubricating material becomes less viscous and is forced out from between the fibers. We are at present searching for some material which will "stay put" at high temperatures.

In that part of our tire cord research which deals with tensile and elastic properties, we have devoted much energy to measurement of these properties and to theoretical considerations. We have determined mechanical hysteresis, elastic modulus, elongation, and growth rate of cords under cyclic loading, paying particular attention to the effect of temperature and moisture on these and similar properties.

The conclusion has been reached, independently by many workers in the field, that tensile and elastic properties of individual fibers are governing factors in cord behavior. Since fiber properties must reflect the chemical and physical structure of the fiber, we have tried to learn some-

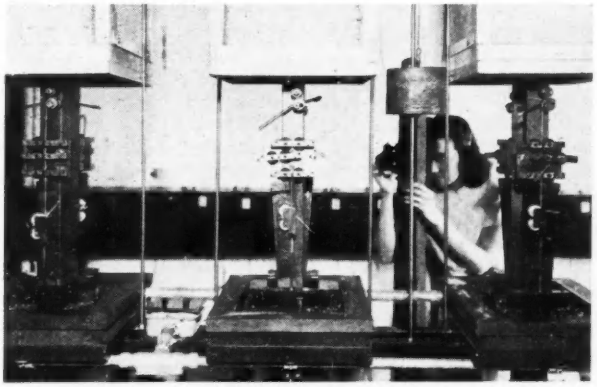

Figure 1. Karrer-Grant Flexing Machine, Multiple Stand.

thing of the latter. Cotton is known to be essentially cellulose, having properties typical of linear high polymers. This simply means that the primary particle of cotton cellulose is a long, thread-like molecule. This contains a repeating unit of six carbons, combined as in ordinary glucose, and each of these units contains three hydroxyl groups. Hydroxyl groups have great affinity for each other, which impels the long thread-like cellulose molecules to line up alongside each other in a fairly regular pattern. Of course, not all the molecules do behave this way, and in a single fiber we have different regions with varying degrees of order. At one extreme may be loose masses of irregularly tangled molecules or amorphous areas, at the other bundles of parallel molecules or crystalline areas. In the general field of high polymers, it has been found that crystalline materials have high tensile strength with a tendency toward brittleness, while amorphous materials exhibit flexibility but lower strength. We decided, therefore, to find the ratio of well-ordered or crystalline regions, to poorly ordered or amorphous regions in our cottons, or the "so-called" crystalline-amorphous ratio. No existing methods of measuring this ratio proved quite satisfactory. We therefore developed our own method, based on the observation that when cotton, or any other form of cellulose, is hydrolyzed, the initial rapid hydroylsis, presumably of amorphous cellulose, is followed by a slower hydrolysis, presumably of crystalline cellulose. There has been recent criticism of the classical view of cellulose as a linear polymer of the type just described, but I may interpolate, that having examined the newer hypotheses and carried out a great many experiments, we have not yet found cause for changing our interpretations. Our measurements by the hydrolysis method show for most cottons about 85-90% of crystalline cellulose in the sense defined above.

Our work on adhesion, which was confined largely to measurement and evaluation, might be mentioned here, though done earlier than most previously discussed. Proper adhesion between cord and rubber is essential to a good tire. However, we found that much adhesion testing was being done at room temperature, whereas tires in service run at a much higher temperature. We accordingly modified one of the existing tests for static adhesion to make determination possible at 275° F., then used this test to determine the effect of a number of commercial dips on the adhesion of various cords to rubber. It was apparent from our results that satisfactory adhesion between cotton and the rubber stocks used for tires was quite easy of attainment, so we diverted our facilities to more urgent work.

For the next property on my reference list, we pass to the entirely different field of crease resistance, in which recent research activity has been high. You are familiar with advances being made by the several large industrial laboratories interested in this property. Our project on the subject has not been active very long. Progress to date has been in testing. We have used mainly urea-formaldehyde resins, rather than melamine, have worked out details for showing microscopically the position of resin relative to fiber, and are, we think, developing a satisfactory method for testing the degree of crease resistance attained. With this done, we shall be able to correlate results. We are interested in the effect of conditions of treatment upon nature of resulting impregnation and consequent fabric properties.

The next property, resistance to weathering, has been the subject of major research at the Southern Regional Laboratory since this Laboratory was established. This research is still going on, so what I shall give you now is but a progress report.

Part of the problem, of course, was to determine just what it takes to resist weathering, or looking at it from the other end, just what it is that we are trying to prevent. For partial answer to these questions, we established year-round patterns of degradation by exposing replicate fabric samples at spaced intervals of 2 months each, throughout the year, under different seasonal conditions. The data we obtained on tensile strengths and cuprammonium fluidity were arranged to form very instructive patterns, differing distinctly for gray goods and for commercially purified cloth. In the gray cloth we frequently find large losses in breaking strength and relatively small increases in fluidity, a type of degradation commonly found in attack by micro-organisms. In commercially purified fabrics, on the other hand, high strength losses are accompanied by high fluidity values. We therefore conclude that while biological attack occurs more readily on gray goods, the photochemical action of sunlight is largely the degrading agent on purified cotton fabrics.

Further work on this subject by Mr. Dean and his co-workers was summarized in a report given at the Chicago meeting of the Association last year. Repeating here to keep the record complete, four types of experimental formulation were tested by outdoor exposure at four geographical locations, by exposure to carbon-arc radiation, and by exposure in a normal incidence cabinet to pure solar radiation. Outdoor exposure and normal incidence exposure rated the treatments in the same order. The four types of treatment were (1) clear resins, (2) resin-bound pigments, (3) pigments precipitated in the fabric, and (4) precipitated pigments subsequently treated with clear resins. The most effective protection was afforded by combining pigments and resins, although each of the four types brought about some improvement. Ureaformaldehyde resins were particularly effective.

Somewhat akin to weather resistance is our next listed property, mildew resistance. I shall stretch the term a little to include attack by any microorganism. Our work in this field began with study of copper naphthenate and related impregnants for sand bags just before and during the war. While these metallic impregnants are excellent inhibitors of microbial degradation, their field of use is definitely limited. Much of our recent effort has been on modifying cotton by partial acetylation. By acetylating cotton to about 21-22% acetyl content in the presence of perchloric acid as a catalyst, a very resistant fabric can be produced. It is being tested now for a wide variety of uses, fishing gear, shoe linings and such, where rotting rather than actinic degradation is the important factor. An interesting use has been in fabrication of rot-proof bags to carry water-softening agents of the ion-exchange type. In this application the outstanding advantages of acetylation are that the product is odorless, colorless, and nontoxic, quite in contrast to copper naphthenate.

Resistance to chemicals, the next property on the list, is a broad phrase. Resistance to weather and mildew resistance could be classed here, since oxygen, water, and enzymes are all chemicals. One phase of our work is with just such a broad base, a fundamental study of the reaction mechanisms by which cellulose may break down, whether the degrading agent be air, water, acid, enzymes or oxidizing agents. In this detailed study of the organic chemistry of cellulose breakdown, we are at present putting our main emphasis on identification of the products of oxidation. I just mention this in passing, and should like to return to the problem of resistance to industrial chemicals.

Our investigations of bleaching belong in this category, since bleaching agents are the most common textile chemicals in the narrow sense of the word. In our studies three general classes of modern commercial bleaching processes were compared. All three produced fabrics of good commercial quality. There were, however, measurable differences in some properties. A caustic soda kier boil with hypochlorite bleach did not give quite as good results when fabric changes were measured, but yielded fabric with the lowest amount of fabric impurities. A caustic soda kier boil

with hydrogen peroxide kier bleach, however, gave the best results so far as fabric changes were concerned, but left the most fabric impurities. Continuous hydrogen peroxide bleaching was intermediate by both criteria.

There were no measurable differences among the three processes in absorbency measured by drop-square or capillary rise, or whiteness measured by reflectance. These results represent commercial bleaching. It might not be valid to generalize beyond the specific processes investigated.

This seems an opportune time to mention a method developed in this connection for rating the water absorption characteristics of fabrics, though more closely connected with another property, absorbency. Essentially, this consists of determining the rate and total amount of water absorption by a disc of test fabric in contact with a damp porous plate. The technique for evaluating print cloth, at least as to relative initial rates, has already been published. Further unpublished work has demonstrated its applicability to towelling, and has shown us how to obtain absolute rating values. This has been carried out in cooperation with the Pacific Mills.

Our water-repellency program falls into two parts. In one we have studied chemical treatments aimed at improving water repellency. In the other, we are trying to produce improved self-sealing fabrics for civilian uses, similar to the military fabrics developed by our Quartermaster Corps and by the Shirley Institute. This is an extension of our previous work on impermeable cotton fire hose. In the first project, we expect to correlate chemical constitution with power to improve the water repellency of cotton fabric. It was soon apparent that we needed a rapid screening test more sensitive than spray rating. We have just developed such a method, which we shall publish shortly. Our activities in the second field have been varied. It might be well to consider here all our investigations on swelling, which are aimed in some cases at improving absorbency instead of water repellency.

Let us look first at our research on evaluation and measurement of swelling. The most obvious method for measuring fiber swelling would be microscopic, but this immediately leads to difficulties, due mostly to inherent perversity of the cotton fiber. The properties of individual fibers vary widely, and many values have to be obtained for a statistically valid average. For measuring cross-sectional areas a thousand fibers usually are necessary to insure validity of results. We chose to measure cross sections rather than ribbon width of longitudinal projections, because we believe added information and greater accuracy justify the increased difficulty and time required.

The procedure is to suspend a bundle of wet fibers in an embedding solution of methyl methacrylate. This is polymerized to a solid mass while the fibers are in the swollen condition. The embedded fibers are cross-sectioned on a microtome, the sections attached to a slide, and the polymer dissolved. The section is mounted in water, with a wetting agent, allowed to soak for 5 minutes, and photographed in this saturated condition. Another photograph is made of the identical section after desiccation over phosphorus pentoxide. Measurements of change in cross-sectional area of individual fibers are made by planimeter on photographic enlargements of 1000 magnification.

We have made similar determinations of swelling after mercerization, but simple cross sections suffice here, since we measure the area and perimeter of the mercerized fiber after drying. Incidentally, linear measurements such as diameter and circumference have been made with a modified map-measuring device developed at our Laboratory.

The results of swelling measurements on our photomicrographs have been very interesting. In most of the cotton samples investigated, both thick-walled and thin-walled fibers swell approximately 25 to 30% in water, from desiccated state to saturation. In one case, Empire cotton, the thin-walled "immature" fibers swelled only 20%, while the thick-walled, "mature" fibers swelled 30%. The most interesting feature of these results appears in comparison with results from the so-called "orifice" test.

The latter depends upon the quantity of water seeping under constant pressure through a measured and weighed bundle of yarn tightly packed into an orifice of standardized dimensions. Instead, a bundle of unspun fibers may be used. The object is to simulate conditions under which swelling of fibers upon wetting will close minute interstices of a fabric to prevent passage of water by "self-sealing" action. In this orifice test, the closing capacity of thin-walled fibers is greater than that of thick-walled fibers.

In comparing results of orifice tests and microscopical measurements it is apparent that swelling is not the only important factor influencing results of the orifice test. That it is important, however, can easily be demonstrated by comparing results of the orifice test using water, with the much greater seepage in use of a non-swelling liquid, such as 1,4-dioxane. The contribution to closing capacity of factors such as fiber shape and size, which determine the nature of the capillary system under test, may greatly outweigh the influence attributable to differences in the absolute swelling values of various cottons. The water permeability of fabrics prepared from these samples is higher for thick-walled than for thin-walled fibers, so that closing capacity, representing the resultant of all pertinent effects, seems more useful for its evaluation than absolute swelling capacity.

Some may ask how we obtained the required amounts of thick- and thin-walled fibers from a cotton sample. For this we used the differential dyeing technique previously developed at our Laboratory. A sample of raw cotton dyed in a mixture of Diphenyl Fast Red 5 BL Supra I and Chlorantine Fast Green BLL, does not dye uniformly. Some fibers dye green and some red. Investigation showed that those dyeing red were thick-walled and those dyeing green were thin-walled. Occasionally a fiber was green for part of its length and red for the rest, and in such cases the fiber was always found nonuniform from base to tip, with a red-dyeing thick portion and a green-dyeing thin portion. This made possible our selection of fibers under the microscope. As you may imagine, it is no easy task to separate a fistful of mixed fibers into a red pile and a green pile; but it can be done, and was done often enough for our work on the swollen cross sections.

There should be definite correlation between degree of swelling and amount of water taken up by cotton. We are therefore trying to measure this water of swelling. In this we have succeeded, but not with the accuracy we desire. We have used several methods. The mechanical expression of superficial, nonswelling water, with subsequent determination of residual "swelling" water was not satisfactory due to experimental difficulties. However, the superficial water can be removed in other ways, such as centrifuging or drying with warm air, and there is an inflection in the curve for rate of removal against time. It is believed that this break occurs when removal of surface water ends and removal of swelling water begins. The break is not very sharp, however. Another method is to measure the temperature of a sample drying in a uniform air current. We have not worked on this long enough to make definite statements.

Now that I have briefly indicated some of the tools we have developed for this water-repellency project, let us take a look at the use thus far made of them. Taking constructions developed by other organizations, we have prepared fabrics, using cottons which showed up well in the orifice test. This usually means relative immaturity as determined by cross sectioning or differential dyeing. By then applying such known agents for improving water-repellency as the Zelan treatment, we have been able to retain the superiority of the chosen construction and cotton over others, and thus attain especially

good water repellency. We have also been able to improve the resistance of fabrics of the self-sealing type, supplementing the swelling of the cotton by use of a highly swellable finishing agent such as hydroxyethyl cellulose. Added to the yarn prior to weaving it serves also as a permanent warp size.

We can also produce cotton of high swelling ability by chemical modification. Treated with alkali and chloracetic acid, cellulose may be etherified by introduction of carboxymethyl groups. If very many of these be introduced, an alkali-soluble product results, which already has a variety of industrial uses. We have found it possible so to limit etherification so that the cotton swells without dissolving. On account of its high absorbency, we are now investigating its possibilities in towelling. Mechanical difficulties, however, hinder its application to self-sealing fabrics.

Leaving water repellency and passing to fire resistance, I should like to outline briefly what we have done in this field during the war and since, although just at the moment the projects are inactive. As you know, work along this line by several agencies was coordinated during the war. Just before this was done, we had been working on the phosphorylation of cotton cellulose by various methods, examining the fundamental properties of the reaction and its products. On phosphorylation in presence of urea we learned that other agencies had been carrying out similar investigations. Our results checked theirs all along the line, so need not be repeated here. We also phosphorylated cotton by means of phosphorus oxychloride in presence of such organic bases as pyridine. Both methods of phosphorylation produce flame proofness and glow proofness, but phosphorus oxychloride causes a considerable drop in tensile strength. Investigation of the two products revealed chemical differences. Depending upon the reaction conditions chosen, cellulose phosphate derived from phosphorus oxychloride contains considerable chlorine, probably bound direct to carbon. It usually contains strongly bound nitrogen, presumably from the pyridine. Moreover, about 23% of the phosphorus is present as a disubstituted phosphate, while cellulose phosphate from the urea process is essentially all monosubstituted.

The work I have just described falls among the fundamental studies. We have also considered practical flameproofing and have found a formulation suitable for wearing apparel, not removed by laundering. The composition is unsuitable for light weight goods; but gives excellent flame resistance, not destroyed by 24 launderings, on outer cotton garments, for which it is suited.

We come now to warmth. The problem is not primarily to make a warm cotton fabric. This is relatively easy. The problem is rather to make a warm fabric of attractive appearance, which will not lose its functional values on repeated laundering. We have started a project on construction of such a fabric, but it has not been going long enough for any report today.

We have not stressed research on the dyeing properties of cotton, at our Laboratory. The chief reason is that this would involve unnecessary duplication of the volume of research by dyestuff manufacturers. We are at present investigating, however, a product we call "aminized" cotton. This is analogous to the carboxymethylated cotton discussed earlier, except that it contains aminoethyl groups instead of carboxymethyl groups. The amino groups have affinity for acid wool dyes, just as the carboxyl groups in the other have affinity for basic dyes. The aminoethyl groups are introduced by reaction with aminoethyl sulfuric acid and alkali.

I am now going to leave projects aimed at improving specific properties, and touch briefly on a few projects in which property improvement is incidental. For instance, we have no continuing project on improving resistance to abrasion, though very much interested in various methods of measuring abrasion and in the interpretation of their results. We have been informed, however, that among other properties of our partially acetylated cotton, there is an increased resistance to abrasion.

In the same way, some resin treatments we have given cotton to improve other properties have incidentally improved resiliency. It is not easy to draw a hard and fast line between resiliency and crease resistance.

Another case is dimensional stability. As such this has received little direct attention in our Laboratory, but the fundamentals of the problem overlap, quite a bit, those of our swelling studies.

Luster is still another property in this class. I have mentioned our interest in mercerization. Improvement of luster has always been one of the ends reached by commercial mercerization, but our project is actually aimed more at other aspects of mercerization, especially at determining varietal differences.

Linting is a fault of cotton in which we have not been interested as such. It is decreased by mercerization, and also by several of the other treatments we have investigated, such as the finishing treatment with the hydroxyethyl ethers of cellulose to increase swelling.

Resistance to stains is of course a desirable property in any textile. For my present purposes, I may define a stain as discoloration produced by an aqueous solution. Obviously resistance to this improves with water repellency. Thus we are actually improving resistance to staining, but only as a research by-product.

Insulating properties are an example, which need defining. The obvious question is "Insulating against what?" As for warmth, we can say that the rot proofness of acetylated cotton may be of interest to those considering cotton batting for heat insulation. It should be mentioned too that partial acetylation of cotton increases considerably its value for electrical insulation which is among the earliest mentioned uses in the patent literature for this material.

Another example is our water-resistant Oxford fabrics, which are also wind resistant to a high degree. We have not yet emphasized this latter property, however.

Permanent crispness is still another secondary property imparted by many of the treatments we have studied. Several of the resin treatments enhance this property, as does finishing with the hydroxyethyl ether of cellulose. We have also given some investigation to acid treatments of the Heberlein type, but this work, dropped during the war, has not been continued.

I have of necessity given only a general and somewhat sketchy outline of a few phases of our work. Any of you interested in further details, or in work I have not mentioned, are cordially invited to write us or to come to New Orleans.

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WNE Section to Meet February 25th

THE next meeting of the Western New England Section will be held on February 25th at the Fairway Restaurant, 2536 E. Main Street, Bridgeport, Connecticut. A dinner, with choice of roast beef or lobster, will precede the meeting. Dinner reservations, at $2.75 each, may be made with Robert N. Brownlee, U. S. Rubber Company, Naugatuck, Connecticut.

Jackson A. Woodruff of American Viscose Corporation will speak on "Some Phases of the Dyeing and Finishing of Fabrics" with emphasis on shrinkage control and levelness of dye application. The return to textile markets of more normal patterns of demand and supply has been reflected in a critical appraisal of the work of dyers and finishers. The emphasis of the converter is on the speed of the dyer handling his order and on obtaining results which must be classed first in quality. Because dyers and finishers will want to improve performance and efficiency, the speaker will aim his discussion toward, 1st, methods of improving levelness of dyeing and, 2nd, a further recognition of some of the physical properties of viscose rayon.

Non-Cellulosic Fibers Group Meeting—

LOW TEMPERATURE PROPERTIES OF TEXTILE MATERIALS*

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Abstract

High altitude flying as well as Arctic and Antarctic military operations require a knowledge of the performance of filamentous materials and other high polymers at temperatures as low as —70°F.

Previous investigations of parachute suspension lines and their component members under standard humidity and temperature conditions have shown requisite properties to be maximum energy absorption, minimum weight and bulk, and minimum shock load to a jumper.

Energy absorption may be directly obtained by measuring the area under a Load vs. Percent Elongation diagram. As temperature is reduced, the normal thermoplastic polymer becomes increasingly stiff and brittle; i.e., its elongation diminishes while its strength usually increases. This may produce a gain or loss in energy depending upon changes in shape of the load-elongation diagram, and upon whether the loss in elongation is compensated by the gain in strength.

Since polymeric materials such as nylon, silk, and rayon, creep or deform when subjected to a stress, rate of loading must also be considered. Yarns which have high elongation and energy absorption, when tested at slow laboratory rates of speed (pulling jaw speed of 12 inches per minute), may lose appreciable elongation and energy when attenuated at impact speeds of 26 feet per second. The combined effect of impact loading and sub-zero temperature may produce changes which may be enormous.

Data are presented on the mechanical properties of silk; undrawn, partially drawn, and fully drawn nylon; Fiber A; Vinyon E; when tested under "slow" and impact loading at room temperature and at —70°F. Since in use, many of these materials must withstand more than one loading, the effect of repeated mechanical stressing under the abov temperature conditions is also discussed.

I. Introduction

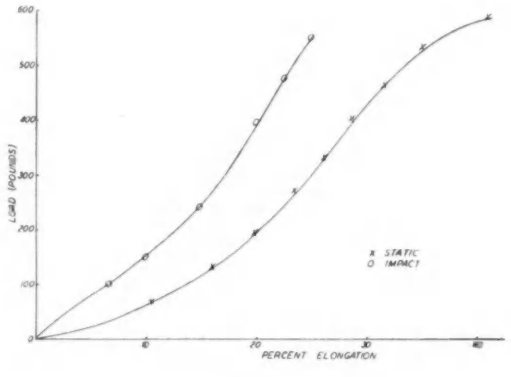
As part of a broad and comprehensive program of study of parachutes and their component parts, the United States Army Air Forces have sponsored a research investigation on the low temperature mechanical properties of textile materials. The importance of such a program is obvious; high altitude flying as well as Arctic and Antarctic military operations require a knowledge of the performance of filamentous materials and other high polymers at temperatures as low as —70°F.

II. Theoretical Discussion

In reports as yet unpublished the joint laboratories conducting this research have discussed certain physical concepts involved in the proper functioning of parachute suspension lines. In reporting on the properties of materials at —70°F., it is advisable first to discuss these concepts.

The basic purpose of a parachute is to transform the kinetic energy of a falling man into potential strain energy so that his descent will be slowed with a minimum of impact. It is physiologically desirable that the man be subjected to as little shock loading as possible. Let us assume that the energy which must be absorbed during the jumper's change in velocity is to be absorbed entirely by the suspension lines. Energy or work is measured as the product of force and the distance through which the force operates. The total energy absorption capacity of a suspension line may be determined by measuring the area under its load-elongation diagram (Graph I), since the coordinates of the diagram are force (lbs.) and elongation (inches/inch). Thus, the area (energy) under the curve is measured as inch pounds per inch (of length). Since in airplanes it is desirable to keep weight at a minimum, it becomes apparent that maximum energy per unit weight (energy per denier) of line is a desired objective in building suspension lines.

If textile materials exhibited linear load-elongation characteristics, it would be a simple matter to determine energy to rupture by simple multiplication, but, unfortunately, this idealized condition is never met. In order to determine the energy absorbed by a material possessing non-linear load-elongation characteristics, it is neces-



Graph I
Load vs. Percent Elongation, 26 Pick Nylon Braid.

* Portion of a Research Program sponsored by the United States Army Air Forces and conducted by the Textile Division, Massachusetts Institute of Technology, and the Fabric Research Laboratories, Inc. Presented at Non-Cellulosic Fibers Group Meeting, Augusta National Convention, October 22, 1948.

sary either to determine mathematically the empirical load-elongation equation by use of the calculus or to planimeter the area under the load-elongation curve.

The shape of the load-elongation diagram is very important. Reference is made to Graph II-a. In this hypothetical example, there are two materials, A and B, possessing the same strength at rupture but having different ultimate elongations. In the case of A (the lower extension material), the area under the curve is considerably less than for B. But now consider Graph II-b.

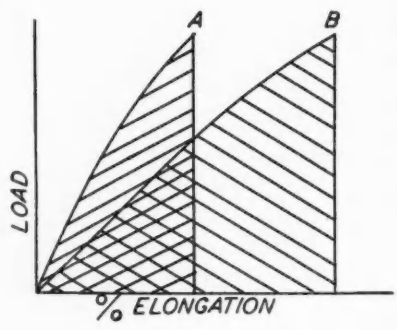
Here A and B have exactly the same streng h and elongation but the paths, and, hence, the areas are very different. In other words, the ultimate strength and elongation have little significance from an energy absorption point of view, unless the shape of the load-elongation diagram is known.

Graph II-c indicates another hypothetical example, but of extreme interest because of its implications. Sample A now has a greater strength than B, but considerably less elongation. Comparing the areas, it can easily be seen that Sample B, although possessing a lower strength, encompasses a greater area and, therefore, is much more desirable from an energy absorption point of view than Sample A.

Consider now the physiological implications on the man resulting from these various examples. It is clear from Newton's third law of motion that any load imposed on the lines will result in an equal and opposite force on the man. Referring again to Graph II-c, let us assume that the energy reflected by the area abc or the equal area ab^1c^1 must be absorbed in order that the man be slowed down to a safe landing speed. If this energy is to be obtained from curve A (area abc), a high load is necessary. It is this load that reacts on the man; i.e., produces the shock. If curve B is used, the same area ab^1c^1 is encompassed at a considerably lower load and the shock is, therefore, less.

Further, if the elongation axis (abscissa) is considered to be time elapsed after the rip cord is pulled, it is obvious that the *rate of loading* for curve A is much higher than for curve B. This means that the process of transforming the man's kinetic energy into potential energy requires a longer time. The lower rate is the more comfortable one (provided he is not so near the ground that time is at a premium). Thus Sample B represents the more ideal condition from a physiological point of view, as the load is applied at a slower rate. Because of the high relative extension, the load is never required to build up too high in order to subtend sufficient area for energy absorption purposes.

The importance of the load-elongation diagram having been demonstrated, it may now be stated that this report discusses the effect of low temperature on the load-elongation diagram of filaments, yarns, and braided lines when tested under low rates of load application (pulling jaw speed of 3 or 12 inches/minute on a tensile testing machine) ,and under impact load at a jaw speed of 26 feet/second. It also discusses properties in repeated stress (cyclical loading and unloading) under the same test conditions.



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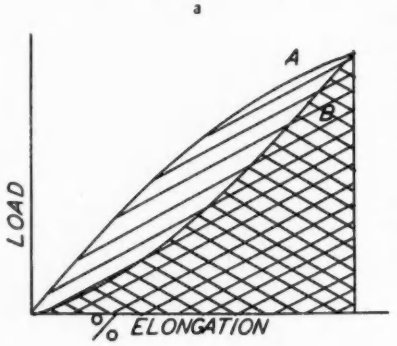

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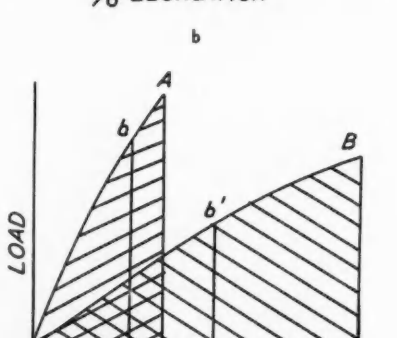


c

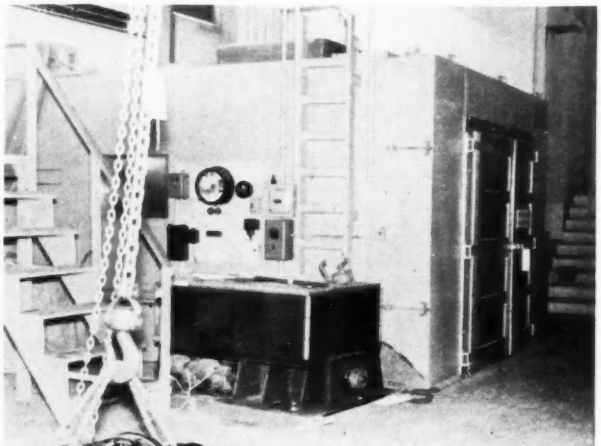
Graph II

III. Description of Testing Facilities

During the war, the Radiation Laboratory at MIT operated a cold chamber. Fortunately, it was available for this research program. No attempt was, therefore, made to operate a testing machine at room temperature and refrigerate the test specimen alone by encasing it in a tube or box with air at the requisite temperature.

The MIT cold chamber (Photograph 1) is a room 10′ x 13′ x 8′ and is refrigerated by pumping methyl chloride through cooling coils; the methyl chloride is refrigerated by dry ice. A temperature of —95°F. is attainable. All of our work was carried out at —70°F.

The "static" (low rate of load) testing machine employed was of the wire resistance, electric strain gage type (Photograph 2). It consists of a servo mechanism pulling jaw enabling changes in pulling jaw speed by adjustment of the servo unit (outside the chamber) rather than by changing gears or pulleys within the room at —70°F! Similarly, the G. E. Photoelectric Recorder was placed outside the chamber for ease of operation. A dual set



Photograph 1

Photograph 2

Photograph 3

of controls was installed so that the instrument could be operated either inside or outside the chamber. Photograph 3 shows the outside controls as well as the G. E. recorder.

Personnel working in the chamber were furnished with regulation flight clothing and electrically heated gloves. Throat microphones were used for communication.

IV. Load, Elongation and Energy Absorption Properties of Filaments, Yars, and Lines Tested at +70°F—65% R.H., and at —70°F

The following materials were tested:

(1) A "pedigreed" set of Undrawn, Partially Drawn, and Fully Drawn Nylon producer's yarn was furnished by the DuPont Company. They are described as:

(a) Undrawn 1030 denier 34 filament

(b) Partially Drawn 550 denier 34 filament

(c) Fully Drawn 200 denier 34 filament

(d) Formic acid is a solvent for nylon. Under proper conditions of time, temperature, and concentration of formic acid solution, nylon can be shrunk to produce a heavier but appreciably more extensible yarn. The fully drawn nylon was so treated and is identified as "F.A." Treated Fully Drawn Nylon. .

(2) 190 Denier Fiber A.

(3) 1354 Denier Vinyon E.

(4) 210/3 Nylon Parachute Suspension Line Sleeve Yarn.

(5) 210/5/3 Nylon Parachute Suspension Line Core Yarn.

6) 26 Pick Nylon Suspension Line (Presently used by the Army Air Forces).

(7) 16 Pick Silk Suspension Line (Formerly used by the Army Air Forces).

Table I tabulates data taken on the above materials. Sub-zero and room temperature values are compared.

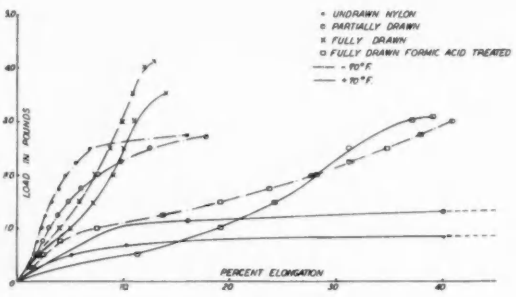
TABLE I

LOAD, ELONGATION AND ENERGY ABSORPTION PROPERTIES OF FILAMENTS ' YARNS, AND LINES TESTED AT +70° F. 65% R. H., AND AT —70° F. TESTED AT A PULLING JAW SPEED OF 12 INCHES/MINUTE

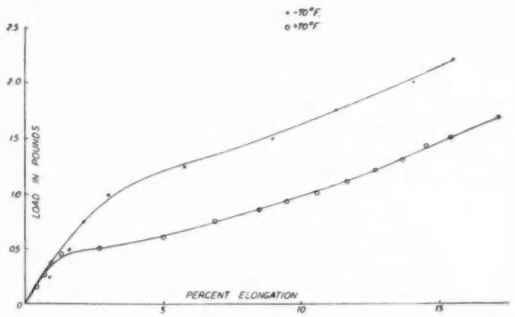
		Breaking Load (lbs)	Elongation (%)	Denier	Tenacity (gms/den)	Energy Absorption (in. lbs/in)	Energy/ Denier (in. lbs/in/ den(x 10^{-6})
Undrawn	+70° F.	2.3	372.5	1,016	1.0	4.74	466.0
Nylon	—70° F.	2.7	16.0	.....	1.2	0.35	34.4
	% Change	+17	—98	.....	+20	—93	—93
Partially	+70° F.	2.1	145.3	541	1.8	2.02	373.0
Drawn Nylon	—70° F.	2.7	17.9	.....	2.3	0.34	62.8
	% Change	+28	—88	.....	+28	—83	—83
Fully Drawn	+70° F.	3.5	12.3	200	8.0	0.21	103.0
Nylon	—70° F.	4.1	12.7	.....	9.3	0.24	120.0
	% Change	+17	+3.3	.....	+16	+14	+14
Fully Drawn	+70° F.	3.2	40.2	259	5.6	0.52	201.0
F. A. Nylon	—70° F.	3.0	40.8	.....	5.2	0.67	258.0
	% Change	—6.3	+1.5	.....	—7.1	+29	+29
Fiber A	+70° F.	1.7	17.2	190	4.1	0.15	80.0
	—70° F.	2.2	15.7	.....	5.3	0.21	111.0
	% Change	+29	—9	.....	+29	+40	+40
Vinyon E	+70° F.	0.47	336.0	1,354	0.16	0.86	63
	—70° F.	1.4	131.7	.....	0.47	1.45	107
	% Change	+198	—61	.....	+198	+68	+68
Nylon Sleeve							
Untreated	+70° F.	9.8	23.4	673	6.59	1.09	162
	—70° F.	13.2	17.5	.....	8.88	1.09	162
	% Change	+34	—25	.....	+34	0.0	0.0
F. A. Treated	+70° F.	8.9	41.3	757	5.31	1.55	203
	—70° F.	12.2	33.7	.....	7.29	2.01	266
	% Change	+37	—18	.....	+37	+30	+30
Nylon Core							
Untreated	+70° F.	45.6	31.9	3,628	5.69	6.45	178
	—70° F.	57.0	26.1	.....	7.10	7.13	196
	% Change	+25	—18	.....	+25	+11	+11
F. A. Treated	+70° F.	44.9	40.7	3,998	5.08	7.81	195
	—70° F.	67.0	30.5	.....	7.60	7.61	190
	% Change	+49	—25	.....	+40	—3	—3
Nylon Line	+70° F.	586	40.9	58,765	4.52	104.2	177.3
	—70° F.	617	37.1	.....	4.75	80.7	137.5
	% Change	+5	—9	.....	+5	—22	—22
Silk Line	+70° F.	416	18.6	49,070	3.85	36.4	74.3
	—70° F.	561	15.2	.....	5.18	26.6	54.2
	% Change	+35	—18	.....	+35	—27	—27

With the exception of F. A. treated fully drawn nylon (which appears to be somewhat anomalous), all of these polymeric materials have higher strengths and lower elongations at —70°F. than they do at room temperature. The highly extensible unoriented fibers of the undrawn nylon and Vinyon N type lose the major portion of their elongations and energies at —70°F. Hence, such materials which are being used at +70°F. in "'arrestation" harnesses to prevent bodily injuries or fatalities in airplane crashes would be of little value at —70°F. Undrawn nylon, for example, has 372 per cent elongation at +70°F. but only 16 per cent at—70°F.

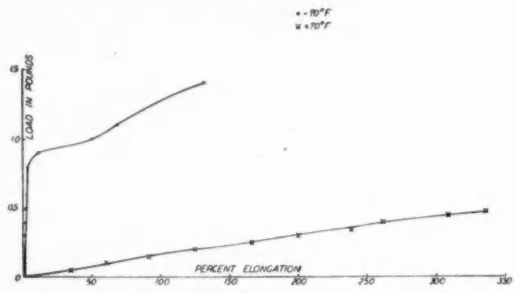
Fully drawn nylon performs as well at —70°F. as it does at +70°F. under low rates of loading (12 inches/minute). Formic acid treated fully drawn nylon has higher energy absorption than regular nylon at both room and sub-zero temperatures. Under low rates of load, nylon suspension lines perform reasonably well



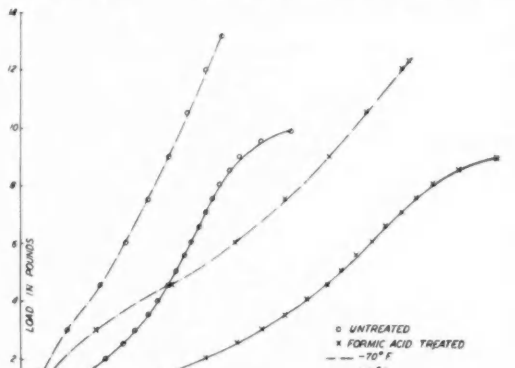
Graph III
Load vs. Elongation Diagrams at +70° F. and —70° F.
"Static" Test
Jaw Speed 12"/min.



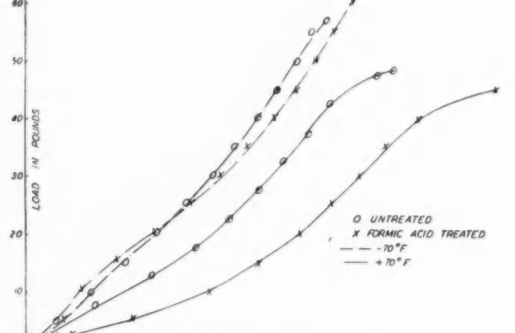
Graph IV
Fiber A
Load-Elongation Properties at —70° F. and +70° F.



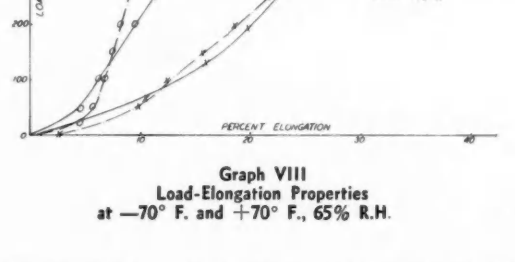
Graph V
Vinyon E (1500 Denier)
Load vs. Percent Elongation
at —70° F. and + 70° F., 65% R.H.
Jaw Speed 12"/min.



Graph VI
Nylon Sleeve Yarn 210/3
Load-Elongation Properties
at —70° F. and +70° F., 65% R.H.



Graph VII
Nylon Core Yarns
Load-Elongation Properties
at —70° F. and +70° F., 65% R.H.



Graph VIII
Load-Elongation Properties
at —70° F. and +70° F., 65% R.H.

at —70°. Elongations diminish when compared to room temperature; loads may increase or decrease, depending upon "elongation balance" (described below). Energies diminish but not to any serious extent, for at —70°F. a 26 pick nylon line has more energy than does a silk line at room temperature.

V. "Impact" vs. "Static" Loading

It has been the general experience of investigators measuring the strength of materials that higher rates of load show higher strengths and lower extensions at rupture; i.e., the modulus of elasticity increases. A study of impact rates of load with the MIT Dropping Weight Strain Gage Impact Tester* wherein the test specimen is attenuated at a rate of 26 feet per second has corroborated this finding. The most widely accepted explanation for

* Hindman and Crook: The Electric Strain Gage and Its Use in Textile Measurements, Textile Research Journal, Vol. XV No. 7, July, 1945.

TABLE II
Load-Elongation Properties of 26 Pick O. D. Nylon Line H

	Room Temperature 65% R.H. +70°F. Jaw Speed		Sub-Zero Temperature —70°F. Jaw Speed	
	26'/Sec.	3"/Min.	26'/Sec.	3"/Min.
Breaking Load (Lbs.)	538	560	630	768
Elongation (%)	23.1	35.6	21.1	28.5
Tenacity (Gms./Denier)	4.25	4.44	4.98	6.06
Energy (In. Lbs./Inch)	50.2	82.0	59.6	84.7
Energy/Denier (x 10^{-2})	89.5	142.9	104.0	147.5

this phenomenon is that at high rates of load the rupture load is attained so quickly that the material does not have a chance to deform; hence, the elongation is less than would be the case at slow rates of loading. Because the specimen does not extend, no "necking down" takes place. The load per unit area (stress concentration) probably remains the same, but, since the total area of cross-section is not diminished, the total breaking load remains high.

Parachute suspension lines are used in impact, and a considerable amount of data on "impact" vs. "static" loading has already been amassed in this research but has not yet been published.

The problems involved in testing materials at —70°F. at slow rates of load are many. If the requirement of impact loading is added, the problem becomes complex indeed. The freely falling weight impact tester at MIT has a maximum pulling jaw speed of 26 feet per second. It was found impossible to conduct low temperature impact tests with this instrument, since the cold chamber was only 7 feet high, and an approximate height of 15 feet is required to drop the weight and attain the required velocity when it strikes the specimen which is approximately 4 feet from the floor. Furthermore, it was desirable to attain speeds greater than 26 feet per second. To that end, a rotary flywheel type of rotary impact tester was constructed. The energy for testing in this device is supplied by a steel flywheel 24 inches in diameter and 3 inches thick. One end of the flywheel shaft is driven by Vee belts from an electric motor. The flywheel carries a pair of steel projections or "horns" on its circumference. A wooden striking bar is projected by springs into the path of the horns. The horns carry the striking bar through 45° of their rotation, while the striking bar is guided in its circular path by stationary circular cam surfaces. After traveling through 45°, or about 10 inches, the striking bar is "plowed" out of the horns by two other stationary cam surfaces. Attached to the striking bar by a steel tape is the lower of the two testing jaws. When the striking bar is carried around by the horns, the tape winds up on the flywheel and pulls the lower jaw at a constant rate of elongation. The upper jaw is attached to a conventional strain gage whereby loads are recorded in the same manner as is employed in the presently used falling weight impact tester.

Because of the complexities involved in operating the rotary impact tester at —70°F., only preliminary data have as yet been taken. Table II compares "static" vs. impact properties of the presently used nylon suspension line tested at room temperature and at —70°F.

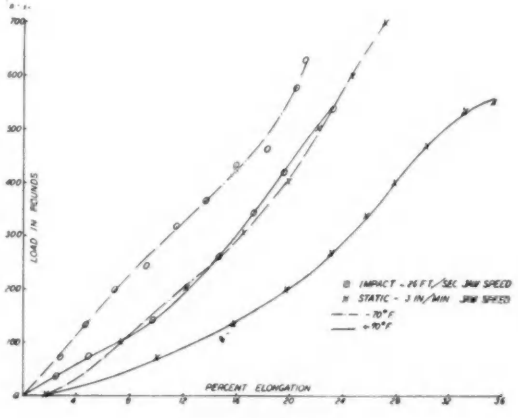
Examination of Graph IX will show an extremely interesting condition. The impact-room temperature diagram superimposes on the static-sub-zero diagram. Thus, the increase in modulus may be attained either by reducing the temperature or increasing the rate of load. If both of these conditions are imposed, the stiffness increases still further.

It has been stated that impact breaking loads are higher than static loads. Table II shows the reverse to be true for this particular line. The reason for this apparent anomaly may be explained by the term "elongation balance." Simple yarns such as low twist singles almost always show higher impact strength. Complex structures such as braided parachute lines oftentimes do not. A parachute line is composed of an outer braided sleeve and an inner twisted core. Hamburger* has shown that unless elongation of the core and sleeve are equal (i.e., elongation balance is attained) at their respective rupture points, a low breaking load will result. In order to meet government specifications which involve "static" testing, suspension line manufacturers strive for elongation balance when the lines are tested at 12 inches/minute. Three elongation components compose the total elongation in the braided sleeve—(1) Inherent elongation of the filament, (2) Helix effect (the yarns lay in spirals in the braid), (3) Crimp. Only two components make up elongation in the core—(1) Inherent, (2) Crimp. Since changes in rate of load do not cause proportionate changes in the various elongation components, it is almost impossible to construct a suspension line which is in balance under every test condition of rate of load or temperature. Thus, the line in question is in elongation balance when tested at 12 inches/minute, but is out of balance when tested at 26 feet/second, and thus is of lower strength.

VI. Repeated Stress Properties

In use, textile and other polymeric materials are often called upon to withstand more than a single load application. While a parachute is not likely to be subjected to cyclical loading and unloading, it is a fact that they may be used more than once. Therefore, it is vital to know the effect of one or more load applications upon strength, elongation and energy absorption.

* Hamburger, W. J.: Effect of Yarn Elongations on Parachute Fabric Strength, Rayon Textile Monthly, March and May, 1942.



Graph IX
Sample H O.D. 26 Pick Nylon Braid
Load vs. Percent Elongation
Tested under Static and Impact
Conditions at —70° F. and +70° F.

Considerable ambiguity has existed in the technical literature with respect to quantitatively defining and measuring repeated stress performance. Hamburger* has developed an Elastic Performance Coefficient which reflects the effect of immediate-elastic, primary creep, and secondary creep deflections. Hamburger states that "elasticity or resilience may be generally defined as the ability of a material to return to its original form or shape upon the removal of a previously applied load." Deformation is divided into two major components:

1. Immediate Elastic Deflection
2. Delayed Deflection

   The delayed deflection is further sub-divided into:

   a. Primary creep, the recoverable portion of the delayed deflection.
   b. Secondary creep, the non-recoverable portion of the delayed deflection (permanent set or plastic flow).

It is not the purpose of this paper to discuss the theoretical factors involved in the measurement of repeated stress and elastic performance. It is stated, however, that the following criteria of repeated stress are employed in evaluating the materials being investigated:

1. Per cent Corrected Residual Elongation (Elongation to rupture remaining in the material after repeatedly stressing the material for five loading cycles and thence rupturing it on the sixth cycle)
2. Breaking Load (After repeated stress)
3. Energy Absorption (After repeated stress)
4. Per cent Secondary Creep (Non-recoverable elongation or permanent set)
5. Elastic Performance Coefficient.

The Elastic Performance Coefficient (E. P. C.) is a normalized index which expresses the degree of perfect elasticity exhibited by a material. A material which exhibits the identical elastic properties after repeated stress (5 cycles), which it had originally (one-time loading), is called perfectly elastic and has an E. P. C. of 1.0. Similarly, a perfectly viscous material would have an E. P. C. of zero.

The following repeated stress procedure was adopted: (All values are "static" measured at a pulling jaw speed of 12 inches/minute.)

The specimen was inserted into the machine and loaded to 25 per cent of rupture whereupon the pulling jaw was reversed and the load allowed to diminish to zero. When the jaw had returned to its original gage length, a stop watch was started and

* Hamburger, W. J.: "Mechanics of Elastic Performance of Textile Materials," Textile Research Journal, Vol. XVIII No. 2, February, 1948.

TABLE III

REPEATED STRESS PROPERTIES OF YARNS STATIC TESTED AT 65% R. H. +70° F. AND AT −70° F.

PULLING JAW SPEED 3"/MINUTE

	Fully Drawn Nylon						Partially Drawn Nylon			Undrawn Nylon		Fiber A		Vinyon E	
Single Load to Rupture	*Untreated*		*F.A. Treated*									*Percent of Rupture Load*			
					25%	50%	90%	25%	50%	90%	25%	50%	90%	25%	50%	90%
Breaking Load (lbs)	3.5		2.90				2.21			2.15		1.74				
	4.16		3.65		1.9	2.2	2.3	2.1	2.6	2.60		2.38		0.38		
	+31.4		+25.8		3.0	2.8	2.9*	2.6	2.6	+20.9		+36.7		1.48		
Elongation %	15.0		51.8		+58	+27	+26	+19	+30	516		18.9		+292		
	12.5		44.9							18.9		15.3		322		
	−16.6		−13.7							−96		−19.1		146		
	0.25		0.61				2.65			6.22		0.17		−54.7		
Energy (in. lbs/in.)	0.28		0.84				2.02			0.42		0.22		0.68		
	+12.0		+39.4				−23.8			−93		+29.4		1.61		
Denier	200		252				500			1000		190		+137		
Energy/Denier (x 10^{-3})	135		243				530			622		89		1354		
	138		334				404			42		116		50.1		
	+10.4		+37.5				−23.8			−93		+30.3		1190		
														+137		

Repeated Stress Properties	*Percent of Rupture Load*															
	25%	50%	90%	25%	50%	50%	25%	50%	90%	25%	50%	90%	25%	50%	90%	25%	50%	90%
Breaking Load (lbs)	3.4	3.4	3.4	2.8	2.9	....	1.9	2.2	2.3	2.1	2.6	....	1.7	1.7	1.6	0.3	0.3	....
	4.5	4.1	4.5*	3.4	3.1	3.2*	3.0	2.8	2.9*	2.6	2.6	2.5*	1.9	2.1	2.2	1.5	1.6	1.6
	+32	+21	+32	+21	+7	....	+58	+27	+26	+19	+30	....	+12	+24	+38	+400	+433	....
Corrected Res. Elongation (%)	15.0	15.0	14.8	37.9	27.5	....	168.6	102.4	21	545	103	....	18.7	13.3	8.5	222.3	185.3	....
	13.6	11.2	10.3	37.4	20.8	13.5	70.5	57.3	65.7 (?)	19or228	15or260	12.6	12.7	13.2	6.9	127.8	130.8	59 3
	−9	−25	−30	−1	−24	....	−58	−44	.....	−96or−58	−86or−53	.....	−32	−0.7	−19	−42	−39	....
Energy Absorpt. (in. lbs/in.)	0.23	0.24	0.18	0.54	0.37	....	2.20	1.55	0.27	6.48	1.56	....	0.17	0.13	0.07	0.33	0.19	....
	0.28	0.22	0.20	0.70	0.39	0.23	1.86	1.39	1.68	43or5.5	.33or6.3	0.27	0.17	0.18	0.08	1.55	1.66	0 73
	+22	−9	+11	+30	+5	....	−15	−10	+523	−94or−14	−79or+303	.....	0	+39	+14	+37	+774	....
	0.1	1.1	14.1	29.2	.....	....	0.7	34.9	149.2	0	211	.....	0.7	5.3	11.3	0.0	15.8	....
Secondary Creep (%)	0.0	3.9	6.1	0.7	12.6	21.5	0.0	0.5	5.7	0(?)	0(?)	0.2(?)	0.3	1.2	6.9	0.0	0.3	35 6
	0	+3800	+455	−93	−48	....	−100	−99	−97	0	.....	.....	−57	−77	−39	0	−98	....
Elastic Performance Coefficient	1.00	1.00	1.03	0.51	0.48	....	0.89	0.44	0.22	0.93	0.15	.....	0.78	0.32	0.32	1.28	1.27	....
	0.90	1.00	0.56	0.48	0.31	0.26	1	0.62	0.40	0.97(?)	0.99(?)	0.92(?)	1	0.39	0.20	0.99	0.70	0 12
	−10	−43	−44	−59	−36	....	+12	+41	+82	+4	+560	.....	+28	+22	+37	1	−30	....

* 75% of rupture, % C = % Change from room temperature.

TABLE IV

REPEATED STRESS PROPERTIES OF NYLON 210/3 SLEEVE YARNS AND 210/5/3 CORE YARNS "STATIC" TESTED AT 65% R. H. +70° F. AND AT −70° F. PULLING JAW SPEED 3"/MINUTE

Single Load to Rupture	210/5/3 Core Yarn +70°F.	210/5/3 Core Yarn −70°F.	210/5/3 Core Yarn %C	210/3 Sleeve Yarn +70°F.	210/3 Sleeve Yarn −70°F.	210/3 Sleeve Yarn %C
Breaking Load (lbs)	45.6	57.0	+25	9.80	13.2	+35
Elongation (%)	31.9	26.1	−18	23.40	17.5	−25
Energy (in. lbs/in.)	6.45	7.13	+11	1.09	1.09	0.0
Denier	3628	3628	(−)	673	673	(−)
Energy/Denier (x 10^{-3})	178	197	+11	162	162	0.0

Repeated Stress Properties	*Percent of Rupture Load*									*Percent of Rupture Load*								
	25%			*50%*			*90%**			*25%*			*50%*			*90%**		
	+70	*−70*	*%C*	*+70*	*−70*	*%C*	*+70*	*−70*	*%C*	*+70*	*−70*	*%C*	*+70*	*−70*	*%C*	*+70*	*−70*	*%C*
Breaking Load (lbs)	45.5	55.3	+22	45.2	50.3	+11	45.6	53.7	+18	9.3	13.5	+45	9.7	13.6	+40	9.8	12.6	+29
Corrected Resid. Elong. (%)	31.1	22.6	−27	25.9	15.7	−39	18.4	12.6	−32	20.4	15.3	−25	18.3	12.1	−34	15.5	9.8	−37
Energy (in. lbs/in.)	7.05	6.11	−13	6.03	4.08	−32	3.32	3.14	− 5	0.96	0.99	+ 3	0.83	0.83	0.0	0.70	0.58	−17
Secondary Creep (%)	4.00	2.63	−34	8.06	8.18	+ 1	13.77	12.07	−12	1.68	0.52	−69	3.71	3.73	+ .5	6.84	6.23	− 9
E. P. C.	0.46	0.44	− 5	0.42	0.32	−23	0.42	0.32	−24	0.49	0.78(?)	+59(?)	0.47	0.42	−12	0.49	0.41	−17

* −70°F. data taken at 75% of rupture load

TABLE V

REPEATED STRESS PROPERTIES OF SUSPENSION LINES "STATIC" TESTED AT 65% R. H., 70° F. AND AT −70° F. PULLING JAW SPEED 3"/MINUTE

Single Load to Rupture	*Untreated 26 Pick O. D. Line H* +70° F.	−70° F.	% C	*Formic Acid Treated 26 Pick O. D. Line H* +70° F.	−70° F.	% C	*16 Pick Silk Line M* +70° F.	−70° F.	% C
Breaking Load (lbs)	560	768	+37	507	709	+40	450	591	+31
Elongation (%)	35.6	28.5	−20	52.9	50.0	−6	18.3	16.1	−12
Energy Absorp. (in. lbs/in)	82.0	84.7	+3	97.8	137.1	+40	36.6	40.6	+10
Denier	57,400	57,400	....	63,250	63,250	....	49,070	49,070	....
Energy/Denier (x 10^{-3})	143	148	+3	155	217	+40	74.6	83.0	+10

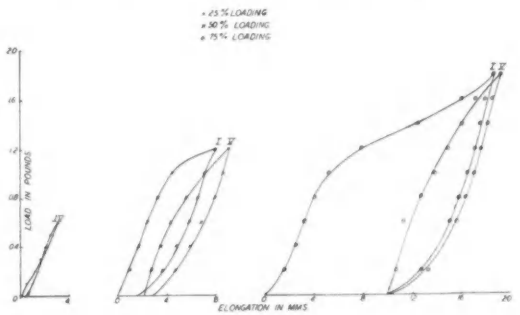
Repeated Stress Properties	%L	+70°F.	%L	−70°F.	%L	+70°F.	%L	−70°F.	%L	+70°F.	%L	−70 F.
Breaking Load (lbs).	25	577	18	718	25	500	20	603	25	442	24	558
	50	556	37	743	50	472	40	585	50	420	47	546
	75	554	55	720	80	490	60	625	76	386	71	513
Corrected Residual Elongation	25	29.3	18	23.4	25	35.8	20	32.1	25	14.6	24	11.6
	50	23.6	37	19.3	50	26.7	40	22.5	50	11.8	47	11.6
	75	21.8	55	15.1	80	20.4	60	16.1	76	6.8	71	7.8
Energy Absorption (in. lbs/in.)	25	76.6	18	74.1	25	79.6	20	91.0	25	33.8	24	31.7
	50	59.6	37	69.7	50	55.7	40	68.8	50	23.3	47	33.9 (?)
	75	56.4	55	52.3	80	38.5	60	56.7	76	12.4	71	18.0
Secondary Creep	25	4.76	18	3.8	25	13.0	20	6.4	25	2.1	24	3.8
	50	9.07	37	7.6	50	20.3	40	16.2	50	6.1	47	4.5
	75	12.50	55	9.1	80	27.0	60	27.7	76	9.1	71	6.2
Elastic Performance Coefficient	25	0.39	18	0.28	25	0.22	20	0.20	25	0.33	24	0.41
	50	0.32	37	0.19	50	0.23	40	0.16	50	0.20	47	0.39
	75	0.32	55	0.22	80	0.23	60	0.14	76	0.19	71	0.30

% C = Percent Change
% L = Percent Load

one minute allowed to elapse, during which time the specimen was given opportunity to recover. A second, third, fourth and fifth loading cycle followed, allowing one minute for relaxation between cycles. The specimen was broken on the 6th cycle.

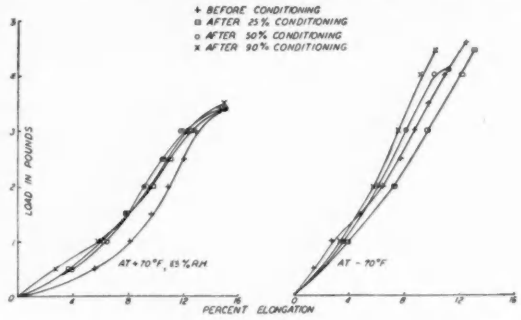
Similar data were taken by repeated stressing at 50 per cent and at 75 per cent to 90 per cent of rupture.

Table III tabulates room temperature and sub-zero data of Undrawn, Partially Drawn, and Fully Drawn Nylon; Fiber A; and Vinyon E. Table IV shows data on nylon core and sleeve yarns; Table V shows similar data on nylon and silk suspension lines.



Graph X
Fiber A
Repeated Stress Properties at −70° F.
First and Fifth Cycles

* 75% of rupture. % C = % Change from room temperature.



Graph XI
Fully Drawn Nylon
Before and After Mechanical Conditioning for Five Cycles at —70° F. and +70° F., 65% R.H.

Graph X may be used to demonstrate the typical repeated stress diagram of a yarn which exhibits secondary creep. If Fiber A is loaded to 25 per cent of rupture, its hysteresis loop is small; i.e., the recovery curve almost superimposes on its loading curve. The fifth loading cycle superimposes upon the first. Therefore, at this per cent loading, Fiber A has excellent repeated stress properties. Its secondary creep amounts to 0.3 per cent and its E. P. C. is 1.0. At 50 per cent loading, plastic flow takes place so that the specimen does not recover to its original dimension. The fifth loading cycle is displaced to the right of the diagram. The secondary creep becomes 1.2 per cent and the E. P. C. 0.39 per cent. At 90 per cent loading, the secondary creep increases to 6.0 per cent (out of a total elongation of 15.3 per cent) and the E. P. C. diminishes to 0.20 per cent. Thus, at loads below the yield point (about 40 per cent of rupture), Fiber A performs satisfactorily; above this point, serious losses in energy occur.

Inspection of Table III will show that at room temperature nylon exhiibts excellent repeated stress properties almost all the way to rupture. The formic acid treatment of nylon increases its secondary creep and decreases its E. P. C. so that the gain in energy produced by the treatment is not a permanent one. The highly extensible materials, undrawn and partially drawn nylon, are extremely poor in their recovery and, hence, should be considered for one-time use only.

Nylon is not as good in repeated stress at —70°F. as it is at room temperature. Secondary creep is greater and E. P. C.'s are less.

Graph XI shows load-elongation diagrams before and after repeatedly stressing fully drawn nylon at +70°F. and —70°F. Repeated stressing slightly stiffens the nylon at room temperature and appreciably stiffens it at —70°F. This is another way of saying that secondary creep is greater at the sub-zero temperature.

An interesting phenomenon occurred with the undrawn nylon at —70°F. In attempting to obtain repeated stress data, it was found that at 25 per cent loading the yarn either broke at approximately 19 per cent elongation or extended to 228 per cent. It is evident that the rate of load under the test conditions employed is critical; probably a slower rate would produce all values of about 228 per cent; a faster rate would produce the 19 per cent extension.

Graph XII shows load-elongation diagrams for Fiber A before and after repeated stressing. Again it is seen that at room temperature 25 per cent loading does not affect the material, but at 50 per cent loading, stiffening occurs. At —70°F., less secondary creep exists so that the 25 per cent curve superimposes; the 50 per cent curve deviates slightly, and it requires 90 per cent loading to produce appreciable stiffening. From the repeated stress aspect, therefore, Fiber A is better at —70°F. than it is at +70°F. It must be remembered, however, that Fiber A has 4 per cent less elongation at —70°F. so that in spite of its repeated stress superiority it has no greater residual energy at —70°F. than it does at +70°F.

Table IV shows that at +70°F. and —70° nylon plied yarns contain appreciable secondary creep and lower E. P. C.'s. This may be explained by pointing out that an additional factor beyond the inherent ability of the nylon to recover must be considered. The core and sleeve yarns are more complex structure than a simple low twist single. They contain crimp which, after loading, is not recoverable. Geometric repositioning of the filaments takes place which contributes to the secondary creep.

Comparing repeated stress properties of the two nylon yarns at the two temperatures shows the same results as occurred for one-time loading. Strengths are higher, elongations are lower, energies are on the average slightly lower.

Table V indicates progressive losses in strength and elongation as per cent loadings increase for all suspension lines. Again, because of yarn and braid geometry, secondary creeps are higher and E. P. C.'s lower than for the nylon filament alone.

In spite of the fact that nylon is not as good in repeated strses at —70°F. as it is at room temperature, it is still appreciably better than silk under any of the test conditions discussed.

Acknowledgments

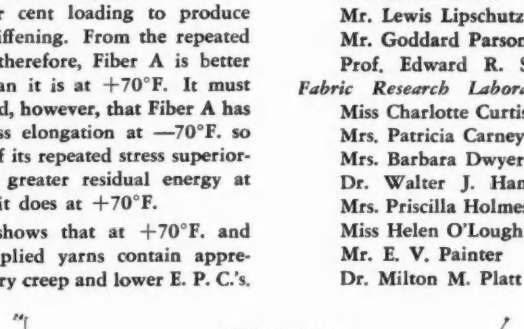
The author is indebted to the following persons for their assistance in conducting this investigation:

Textile Division, Massachusetts Institute of Technology

Mr. George Burr
Mr. Harold Hindman
Mr. Aaron Keller
Mr. Lewis Lipschutz
Mr. Goddard Parsons
Prof. Edward R. Schwarz

Fabric Research Laboratories, Inc.

Miss Charlotte Curtis
Mrs. Patricia Carney
Mrs. Barbara Dwyer
Dr. Walter J. Hamburger
Mrs. Priscilla Holmes
Miss Helen O'Loughlin
Mr. E. V. Painter
Dr. Milton M. Platt



Graph XII
Fiber A
Before and After Mechanical Conditioning for Five Cycles at —70° F. and +70° F., 65% R.H.

New York Section—

PIGMENTED EMULSIONS FOR TEXTILE PRINTING*

HENRY L. YOUNG
Textile Colors Division, Interchemical Corporation

TEN years ago, at the Atlanta convention, a paper was presented on "Printing with Pigments." This was the first official notice to members of AATCC that a new line of fast pigment colors had become available to textile printers. Advantages then given for pigment printing were a sharper mark and complete fidelity in reproduction of engravings; elimination of chemical aftertreatment; new bright colors and effects not obtainable with dyes; and the ability to use pigment colors in combination with soluble dyes. These and other advantages brought rapid increase in the use of pigments. Today they have a definite place in textile printing.

Although fundamentally the same, pigment colors now differ markedly from those of ten years ago. There have been many improvements; in formulation, in constitution and in concentration. The story of this development is fascinating, and perhaps it can be told on another occasion. It has included the development of entirely new pigments, new solvents, new resins and new resin combinations.

Methods of manufacture have undergone changes to develop the full color value of the pigment. Colors as shipped have been concentrated materially. These changes served to lower costs and better the product to such extent as to broaden the field of application tremendously. They brought about more actual preparation of finished color in the color shop, and gave the colorist greater latitude in adjusting to his specific applications.

Pigmented resin emulsions applied to textiles today are complex structures. Textile colorists and chemists in finishing plants have acquired a working knowledge of these emulsions, but those not actually working with them know only the results on printed fabrics. In order to promote better understanding of resin bonded pigments and their preparation for textile printing, the Textile Colors Division of Interchemical Corporation has produced a motion picture called "Pigmented Emulsions for Textile Printing." As you will see, it is not an exhaustive study. It does cover the basic points and will provide a background for discussion along any line of particular interest to you.

*The remarks by Mr. Young preceded the showing of a sound color movie entitled "Pigmented Emulsions for Textile Printing" produced by the Textile Colors Division, Interchemical Corporation, and exhibited at a meeting of the New York Section held on November 19, 1948.

In the back of the hall you will see results of recent printings in various mills, New England, the South, and this area.

At the conclusion of the picture I will introduce to you three members of our staff who will answer questions.

. . . The film was shown at this time. . .

Discussion

Mr. Young: Thinking that some of you would like a little booklet giving the script, we have them at the door, and you can get them on your way out.

I would like to introduce John McCalla, Assistant Sales Manager; Arthur Booth, Technical Director; and Jules Devigne, Central District Sales Manager.

The first question is, "Can resin bonded pigments be stripped?"

Mr. Booth: The answer to that is "No." You can lighten the colors, soap them down somewhat; but as far as we know, there is no effective way of stripping pigments.

Mr. Young: The next is "Can pigment colors be used for discharge?"

Mr. Devigne: For the past seven or eight years, pigment yellow has been used successfully in discharge printing. At present, efforts are being made to increase this line of pigments. That is all we can report at the present on discharge printing. I may add that results look interesting.

Mr. Young: The next question is, "What temperature is required for maximum fastness?" That apparently refers to the curing temperature.

Mr. Booth: The question as to the temperature required for maximum fastness is not one to which we can give a very definite answer. For the best possible fastness, minimum temperatures of 250 degrees Fahrenheit, and somewhat above that, are indicated; but satisfactory fastness is obtained on many classes of material at lower temperatures. Of course time is a factor too.

Mr. Young: The next is, "Can all pigment prints be plisséd?"

Mr. McCalla: The answer is "No". A lot of pigments are destroyed by strong alkali. The same is true of the resins and carriers. Therefore careful selection must be made.

Mr. Young: "What is the best type of furnisher roll for pigments?"

Mr. Devigne: We recommend nylon brushes as the most satisfactory furnisher rollers, for the reason that pigments are easy to wash out of the nylon brushes with a high pressure water hose.

If other furnisher rollers are used the method is to throw the boxes or furnisher rollers in a tank of hot water and later scrub them out.

Mr. Young: The next one is, "What are the prospects of completely eliminating crocking of resin bonded pigments?"

Mr. Booth: Complete elimination of crocking is of course the ultimate end. Substantial progress has been made. Complete elimination is another matter. I think possibly we have friends in the dyestuff industry too, who still wonder about complete elimination. I think we have progressed to the point where crocking is over-stated somewhat in terms of usage.

Mr. Young: "What are the temperature limits for storage of pigment colors?"

Mr. McCalla: We recommend, at the present time, especially for the resins, that they be not exposed to excessive heat; also in some cases but not all freezing is dangerous for the color and the resins. You might say any sensible limits somewhere below 100 degrees and above freezing.

Mr. Young: "Are any special precautions necessary when running pigments in combination with Rapidogens?"

Mr. McCalla: I don't know whether I have an answer for that because it seems everybody has his own pet way to do it. In some cases there is trouble with the color building in the engraving and as a general rule we use an emulsifying agent, pine oil, etc., to help clean out the resin.

Mr. Young: The next one is, "Has any attempt been made to decrease the aromaticity or Kauri Butanol value of oil base pigment emulsion colors, to prevent premature degradation of the printer's synthetic rubber blanket face?"

Mr. Booth: This answer may be subject to some criticism. Naturally many studies have been made with these blankets, and careful analyses have been made of the solvents used, in terms of Kauri Butanol.

I think there is a little misunderstanding on this question of K.B. I don't think it generally realized that you can get a high K.B. number from solvents that have no effect, or very slight effect, on blankets.

Of course, when it comes to the aromatics and the aliphatics, we are not alone in our recommendation. Often printers in the field have made their own studies and *have* gone much higher in aromatics than we suggested, proving, at least to our satisfaction, that danger is over-rated.

Mr. Young: "What storage life do pigment emulsions possess?"

Mr. McCalla: We have checked pigment colors and resins stored for as much as four years; but I would not recommend that as general practice. Climatic conditions have a lot to do with it; also different pigments possess different storage properties, or ageing characteristics, so this must be a relative answer. They can be stored for a fair length of time without any deterioration, if not subjected to extremely high temperatures, or extremely low temperatures, to break the emulsions.

Mr. Young: Here is one more, "Do you have anything that does not have to be baked?"

Mr. Booth: In this pigmented emulsion system we have no colors that you can print and merely air dry in any practical range. Some heat is required. The degree of heat varies considerably. There is wide variation in the fastness required. On certain synthetics, in terms of washing, the requirement is nowhere near as severe as on certain cotton goods. We can vary the temperature somewhat, but we don't print and merely air dry. It would take too long to do any setting at all in that way.

—♦ ♦—

Report, PTI Student Chapter

ON the evening of December 2, Frederick V. Traut of Globe Dye Works Company spoke before the Philadelphia Textile Institute Student Chapter on "Package Dyeing and Equipment." A committee consisting of William Moran, Anna Armenante and Howard Pippy was appointed to make posters and publicize meetings.

Respectfully submitted,
DORIS McALLISTER,
Secretary.

—♦ ♦—

Membership Applications

CORPORATE

The Carey Salt Co., 1101 Rhodes Haverty Bldg., Atlanta, Ga.

Chemical Products Corp., Cartersville, Ga.

Colonial Piece Dye Works, Inc., 2101 83rd St., North Bergen, N. J.

Fulton Bag & Cotton Mills, P. O. Box 1726, Atlanta, Ga.

Georgia Twine & Cordage Co., Forsyth, Ga.

Mt. Vernon-Woodberry Mills, Inc., 201 E. Baltimore St., Baltimore 2, Md.

Myles Salt Co., Div. of Morton Salt Co., 1048 Constance St., New Orleans, La.

Proctor Chemical Co., Inc., Salisbury, N. C.

Riverside Mills, Augusta, Ga.

Washougal Woolen Mills, Washougal, Washington.

SENIOR

Clyde S. Adams, Chairman of Chem. Dept., Antioch College, Dayton, Ohio.

James C. Aitchison, Supt., Washougal Woolen Mills, Washougal, Wash. Sponsors: T. M. Marshal, O. E. Schmidt.

Jane B. Allen, Asst. Dir., Consumer Serv. Bur., Parent's Magazine, New York, N. Y. Sponsors: C. R. Gill, J. R. Hopkins.

Charles A. Anderson, Supervisor, U. S. Finishing Co., Norwich, Conn. Sponsors: G. F. Walz, R. P. Wood.

Norman C. Armitage, Research Dir., Deering Milliken Research Trust, Greenwich, Conn. Sponsors: A. K. Haynes, C. C. Cayce.

Irvin L. Arthur, Chemist, Celanese Corp. of America, Amcelle, Md. Sponsors: W. J. Cramer, Jr., B. F. Pimentel.

Laszlo Auer, Pres., Aula Chemicals, Inc., Jersey City, N. J. Sponsors: L. Balassa, L. B. Cook.

John W. Auman, Chemist, Reading, Pa. Sponsors: H. C. Gift, B. S. Bellemere.

George L. Battye, Tech., Ciba Co., New York, N. Y. Sponsors: D. S. Rion, C. R. Gill.

Peter W. Benn, Plant Chemist, Assoc. Textiles of Canada, Ltd., Louiseville, Que., Can. Sponsors: G. A. Wilkie, C. F. Hanson.

Harry O. Bennett, Asst. Dyer, Oregon Worsted Co., Milwaukee, Ore. Sponsors: T. M. Marshall, A. H. McKenzie.

Henry H. Bestehorn, Chemist, Interchemical Corp., Fair Lawn, N. J. Sponsors: J. A. Zelek, T. Rusticus.

Gas Fading Control Samples

Gas Fading Control Samples, formerly supplied by the Association at Lowell, are now available from Testfabrics, Inc., 224 West 35th Street, New York 1, N. Y. These are in addition to the multifiber and 3 fiber fabric which are also sponsored by the AATCC.

Also available from Testfabrics, Inc. are:

5-gram cotton skeins for use in the Draves Test. Skeins are adjusted individually at ± 2% at 70° F. and 65% moisture.

Cotton soil test cloth. Printed to Spec. 51S-47 (INT.) Bureau of Ships.

Wool soil test cloth. Printed with same soil.

TEXTILE COLORIST AND CONVERTER

Section

DERFLA HOWES SINGLETON
Editor

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Converting Markets

A fortnightly letter of news and views

January 31, 1949

Dear Derfla:

What a month was January!

Downtown in the cotton goods market prices bent a little more, but trading there seemed serene and stable compared with the whipping that prices continued to take uptown in the rayon goods market.

And not in many years has the rayon goods market been as impatient for business as it has demonstrated itself to be in these first weeks of 1949. Technically speaking, of course, there was much justification for this feeling. Probably no more than 20 per cent of current rayon cloth production can be said to occupy a really strong position as to size of inventories or forward orders on the books of mills and converters.

Under the pressures of the past few months, finished rayon goods margins have been steadily whittled down to more normal or pre-war proportions. As was to be expected, finishing quotations have softened under the pressure. Here and there mills' and converters' break-even points have been penetrated under the force of distressed liquidation.

But having taken note of all these experiences, I submit that the worst that can be said about the CURRENT SITUATION has been said. There are still some favorable factors to be considered, although in their recent state of mind not all sellers have been able to see them clearly. Let's take a look.

THE severest phase of the liquidation of excess inventories by converters and jobbers has probably been seen. A certain number of sellers who were too timid to start liquidating realistically in November or December are probably still in a bad way. (A certain few may have also guessed wrong by holding on to inventory with the hope of out-smarting the market.) But the best evidence that some of the pressure is easing can be found in (a) a recent levelling out of a few second-hand gray prices and (b) a more rapid decline in goods billed and held by mills.

Turnover of finished goods has been gaining each week since mid-December. The movement, especially in the dress end of the market, has seemed all too slow and too small in relationship to the prevailing inventories and the prevailing level of mill production. Yet goods are turning over and a major stimulus at retail levels is today's greatly improved values.

To be sure, much of this enhancement of values has been at the expense of the converter's margins. But let's not forget the lush days when the markups were so swell that unit sales finally took a beating.

Now the tables are reversed and there's not much doubt that the loss of dollar volume that this implies is responsible for some of the recent gloom among rayon goods distributors and mills. Our friends would do better to keep their eye on retail unit sales. Units are rising and will, I believe, make a good showing so long as the general economy holds around present high levels.

As to general business conditions, these are less satisfactory than a year ago, but still very strong. National income in the first months of 1949 is expected to be slightly above the comparable period of 1948. While there is an undeniable upward slope to unemployment, no sharp or rapid deterioration is anticipated by the experts in the next several months.

WELL, Derfla, I keep returning to the subject of big-time textile integration. Frankly, I don't know of anything more fascinating or more im-

(*Continued on Page* 147)

The Cotton Outlook

Address of

FRED E. HELLER

Sales Manager, Arthur Beir & Co., At the Piece Goods Group Session of the 38th Annual Convention of the National Retail Dry Goods Association, January 13

MY purpose today is to present the facts as I see them, facts that have been garnered from years of experience in catering to the retail trade, and draw from these facts, in the light of present-day conditions, some common sense conclusions. I have been asked to discuss "THE COTTON OUTLOOK" with respect to the fashion picture, supply, deliveries, service, and last, but not least, the price structure, and I shall endeavor to draw as accurate a picture as possible on each topic, and its relationship to the others.

During the last few years, cottons have taken the lead in the fashion picture, and in order to maintain this position, it will be necessary to employ ingenuity and aggressiveness. The primary job facing every piece goods department, is the continuance of the enviable reputation they now enjoy through the featuring of well-styled quality novelties in a good selection, as well as complete stocks of staples in all the wanted shades. As you know, last year was a very successful plain goods season with such colors as dark browns, dark greens and greys predominating, and we are led to believe that the new Victorian Purples, Fuchias and orange casts, will be the leaders in 1949. The greatest demand last season was for Calico Prints of all types, and present indications point to the continued popularity of this type of styling. Yarn dyed goods, such as Chambrays, Ginghams, Swisses and Cords, have been big sellers, and evidence points towards a continuance in the demand for these woven fabrics. Sheers, last season, were generally disappointing, but that was due in the main, to the lack of ingenuity in styling, coupled with out-of-line prices, but early indications show, where interestingly styled and properly priced, they are coming into their own.

In addition to these fabrics, there have been new developments in the fashion picture on cottons, such as iridescent effects, taffetas, moires, damasks and batiks. There has also been general acceptance of designs inspired through the Oriental feeling, as evidenced by the success of Persian patterns. These are but a few of the new seasonal trends.

As competition increases, it will accelerate improvements in the cotton field, and new developments can be expected in weaving, printing and finishing—particularly in the crease-resistant finishes, all of which should be helpful in maintaining cotton fabric's position as a style leader. No new fashions, particularly in over-the-counter selling, can be successfully merchandised without enabling the customer to visualize how these styles will look in the finished garment.

Today, more than ever, with the consumer being more selective, it is essential to promote the sale of style-wise cottons. Dresses should be made up, merchandise presented attractively, posters and other advertising matter displayed strategically—all these devices must be employed to attract the potential consumer. In addition, sales people must be thoroughly acquainted with, and have a complete knowledge of the various fabrics and the many end uses to which they may be put. Here again, the retailer should select merchandise from sources who know best how to put up goods properly, which will greatly assist in the attractiveness of his department.

Tremendous strides have been made by the pattern companies, who have aggressively promoted the sale of patterns, resulting in increased piece goods business, and are continually bringing out new and easy-to-sew patterns.

Likewise, we owe a debt of gratitude to the sewing machine companies, who have placed more sewing machines in our homes today than ever before in our history. The many classes in home economics that have been introduced in our schools today, to teach home sewing to the teenagers, creates a large group of potential purchasers. Therefore, fortified with the knowledge that the demand for cotton piece goods over-the-counter, has been greatly stimulated by the assistance of the wonderful work done by these various groups—it is equally essential for you to continually promote cotton fabrics, so as to capitalize upon the leadership that cottons have assumed in the fashion picture.

TODAY, we are faced with a far different picture than we were a year ago when this meeting took place. As a matter of fact, I have even heard rumors that it is now a buyer's market, and if my memory serves me correctly, this condition did not prevail a year ago.

However, we are now returning to a more normal seasonal basis for doing business, and the question, no doubt, comes to your mind as to the supply of merchandise, deliveries and service. We all agree that there is no longer any shortage of merchandise, and by this, we mean raw materials, except

possibly in isolated instances. However, we must not be unmindful that scarcities could exist in individual patterns which meet the fancy of the public. Naturally, it is difficult to predict what these few items may be.

Today, deliveries present no problems. There may develop, however, at a future date, a bottleneck on printed goods at the finishing plants in deliveries of desirable finished merchandise. Now, how does this come about? Converters have made up limited amounts of finished fabrics for stock, and are loath to reprint without an indication of the most desirable patterns. This condition is accentuated, as buying is postponed.

As the tempo of buying increases, and orders are placed simultaneously, suddenly all your sources will rush reprinting orders to finishing plants at the same time, and a bottleneck may result. This does not mean, of course, that the buyer cannot purchase finished merchandise. It merely means that for the most desirable patterns that may prove readily acceptable, the buyer may have to wait for his delivery, or purchase different styles elsewhere.

The plain staple situation is somewhat different. Any reputable house, experienced in the ways of the retailer, knows the necessity for prompt plain fabrics deliveries, and carries ample stocks of all colors and qualities, to perform the service expected of him. We must not lose sight of the importance of plain staple fabrics which every piece goods department should carry, especially in the essential colors. It is absolutely a must.

As buying may tend to be on a hand-to-mouth basis, service will become increasingly important. The day of unusually large orders on most merchandise is past, and now the buyer wants to be able to go into the market, and buy his goods for the next thirty to sixty days—then either return again to the market—or place another order with the traveling representatives. This is only common sense in view of the present economic conditions, and, therefore, it is important to have confidence in the sources with whom you deal, and place your orders on novelty and staple merchandise early, even if in limited quantities, in order to assure the delivery and service to which you are entitled.

What is going to happen to prices? Should I hold off my purchases in anticipation of lower prices? Has the cotton market leveled off or will prices go lower? These are questions that are posed every day, and there is no one answer. Each individual has a different operation, and must answer these questions in a way which will apply to his specific needs. During 1948, the cotton textile economy experienced its first major retreat from post-war inflation. The majority of cotton fabrics have undergone, for the most part, the sharpest phase of price deflation and re-adjustment. There are exceptions. Where we all know that certain constructions of carded goods today represent good value, it does not necessarily follow that yarn dyed fabrics, and fine combed goods, have been fully re-adjusted, and it may be that merchandise of this type will face further reductions in the not too distant future.

LET us analyze the price structure a little more carefully. Price structure is really dependent upon two basic economic factors. One, the raw material, and the other—labor. Raw material is cotton, and the Government has placed a floor on cotton. There seems little likelihood at this time, in view of Government policy, that cotton will decline to any great extent.

Labor—Wages are at the highest level in the history of the country, and at the moment, there seems to be no indication that they will be reduced. Therfore, as far as the basic costs—material and labor — are concerned, which determine price structure, there seems very little chance of prices being appreciably lower.

However, we all know that another economic factor, determining price, is supply and demand. The question arises as to whether the production of cotton textiles in this country has so exceeded the demand, that merchandise will have to be sold at cost, or on a below cost basis. We have just undergone a major re-adjustment of the price structure in the cotton industry, and as a result of this decline, the industry today should be in a much healthier condition. We know that there are approximately sixty million people gainfully employed in this country; that the cost of living is gradually, if not appreciably as yet, on the decline; food and clothing are probably past their peak, and the present high level of wages coupled with lower cost of living, should result in an increased purchasing power.

We also know that while there has been a decline in the export markets for cottons in the year 1948, our Government is committed to a huge spending program under the Marshall Plan and for defense of this country. With prices of some cotton fabrics near OPA levels, and in other cases below OPA levels, the sustained purchasing power of the public, full employment, plus the prevailing attractive price levels, should present many inducements for good business.

However, in spite of these economic factors, which are at the mercy of supply and demand, let us assume for the moment that the prices do go lower than those fabrics, which, for the most part, have already been subjected to price readjustment. What policy do we now adopt? Is it better to wait for the lower price, and be without desirable merchandise, during the interim period, or is it wiser to buy conservatively and maintain sales volume, and do business continuously? It would seem that the latter course, purchasing desirable quality merchandise, as you require that merchandise, even if purchased with the knowledge that you may be able to replace this merchandise at a lower level, at a future date, is far sounder business than to be without goods, waiting to buy at lower prices. Based on these facts, it would appear that a sound policy would require re-visiting the market frequently, where possible, and replenishing merchandise as your needs require.

IN conclusion, it is important to bear in mind that while cotton piece goods business over-the-counter may have fallen off in the past few months, compared to the previous year, we are thinking in terms of figures made during a peak period in our history. Are we not spoiled perhaps? Are we not returning to a more seasonal business once again? It would seem that unless general business deteriorates more rapidly and seriously in the near future than it is possible to foresee, the decline in the cotton textile industry that has alrady occurred, probably marked the sharpest phase of the industry's post-war deflation and as a result, we should be entering a far healthier period. With the best selling months ahead of us, the situation should present a pleasant outlook for the retailer in cotton piece goods. Finally, let me stress once again the need for the buyer to purchase correctly styled merchandise in novelties as well as in staples from the sources in whom he has had occasion, over the years, to have full confidence, and from whom he has received the fullest cooperation. After all, it is through such cooperation and mutual confidence, between retailer and resource, that successful business should result.

Textile Research Achievements in 1948*

by
JULIUS B. GOLDBERG
Research Director
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THOSE of us who are closely allied with the textile industry are often unaware of the developments which are being introduced from day to day, and we are likely to overlook the progressive innovations unless they are dramatic. But there have been new products, equipment and processing methods which testify to the continued achievements of textile research in bringing to the consumer better fabrics or in providing more efficient manufacturing operations.

1. Fibers and Yarns

While we are unable to record anything as exciting and successful as nylon, there have been many improvements made in existing yarns either through modifications in the basic components or through changes in methods of manufacture.

The Virginia-Carolina Chemical Company started production of their "Vicara" fiber in the plant formerly occupied by the Aralac Company, but changed diets from the original peanut protein to zein corn protein as a basic raw material. Sample fabrics made with fairly high content of this newest "wool-like" fiber show promise of arousing increasing interest, although the relatively high cost is a restraining factor which cannot be overlooked. It will be recalled that experimental spinning of fiber from zein had been carried out in recent years at the Department of Agriculture Northern Regional Research Laboratory in Peoria, Illinois.

The Carbide and Carbon Chemicals Corporation disclosed technical data on the seven types of Vinyon "N" available in limited amounts.

Laboratory scale production of a mono-filament polyethylene fiber was announced by the American Viscose Corporation, similar to the products made by the DuPont Company using the Imperial Chemical Industries, Ltd. process and also by Carbide and Carbon Chemical Corporation in 1944.

Late in the year, the American Bemberg Corporation introduced an improved cuprammonium yarn and the claims of better uniformity and improved dyeing characteristics are now being investigated through practical mill trials.

The DuPont Company's "Fiber A" showed signs of emerging from the infant toddling stage when it was formally christened "Orlon" and plans were revealed for the construction of a new plant to raise it from the Pilot Plant class to commercial volume within the next two years. Reports also emanated from the same company of further progress in the development of "Fiber V", more commonly known by its Imperial Chemical Industries' name of "Terylene", but no significant poundage can be expected for some time. As publicized over a year ago, this material is of particular interest because of its high modulus of elasticity, and its resistance to heat, light, acids, alkalies and bleaching agents.

From Italy, France and Japan have come reports of improved viscose process rayons with unusual resilience, and others with reduced swelling and shrinkage properties. By way of novelty it was said that experiments have been conducted in England on the treatment of sisal waste to yield a pectate suitable for making a new synthetic fiber.

A true product of research was "Monocord", a non-twisted sewing thread, developed by Belding Heminway Corticelli Company.[1] This is made by a unique welding operation which binds together a number of parallel filaments and yet retains air space between them and most of the flexibility of the original multi-filament yarn. Original pilot plant production has been on an all nylon yarn and is being introduced to the trade as "Nymo".

Following the revolutionary continuous spinning technique initiated commercially by the Industrial Rayon Corporation several years ago, the American Viscose Corporation only recently revealed plans to make yarns by their new "Filamatic" process. This operation is said to shorten spinning time to a matter of seconds while yielding a lower cost yarn with a high degree of uniformity and with only 3% residual shrinkage.

New Patents

Patents were issued in this country and abroad on the preparation of continuous filament yarns by a process comprising the dissolving in aqueous alkali of a reduced wool, then precipitating, re-dissolving and spinning; the production of viscose filaments with horseshoe cross-section, presumably for imparting curl rather than good luck; cellulose acetate fibers with wool-dyeing properties; crimped filaments made of joined dissimilar regenerated cellulose or thermo-plastic materials; improved polyvinyl alcohol filaments; and a cyanoethyl ether of cellulose which might be used to make yarns.

A British patent disclosed the use of a special lubricant to card and spin yarns of kapok suitable for weaving without appreciable breakage, incorporating small amounts of viscose or cellulose acetate fibers.

Natural Fibers

Not to be outdone by the laboratory scale production of yarns and fabrics from chicken feathers in this country over a year ago, a South African was said to have invented a secret method of manufacturing a soft, durable cloth from ostrich feathers.

The perennial ramie plant again proved to be the source of one of our hardiest fibers, surviving the onslaught

*Delivered before the January meeting of the American Association of Textile Technologists.

of caustic critics and acid antagonists and emerging undaunted in frequent news dispatches and press releases.[2] Its devoted supporters continue to provide nourishment in the form of new funds to exploit its growth, decortication and processing, but as yet it has not reached the popularity or success of its brother vegetable fibers or the man-made pretenders to the throne of "King Cotton".

"Fesslin" was announced as an improved, purified form of flax fiber which can be handled on conventional cotton manufacturing equipment by itself or in blends with other fibers.

The silk worm is still turning in its struggle for survival, and it was reported that the use of thousands of new Italian-made machines would make Brazil the world's largest producer of silk in about two years, with prices low enough to compete with rayon.

The improvement of cotton fibers, yarns or fabrics by chemical treatment to make them more lustrous and increase dyestuff affinity is the subject of a British patent issued last February.

2. Manufacturing Methods and Equipment

Fiber and Yarn Processing

Important contributions to the art of improved fiber blending were the Proctor and Schwartz automatic sandwich blending unit and a fiber feeder meter manufactured by the Houdaille-Hershey Corporation for handling 200 to 300 pounds of fiber per hour. The former company also started manufacture of a new single step wool opening machine said to decrease noilage and to have an output of up to 8,000 pounds of grease weight wool per hour.

The Saco-Lowell Company offered a new vertical cotton opener, a worsted spinning process for fibers up to about 4" in length, the "New Era" power-saving spindle and a direct spinner for converting rayon tow to a yarn as fine as 80's.

The Whitin Model "J" high speed comber afforded a 27% increased speed of the combing cycle and other improvements to provide better drafting of fibers.

Nylon offered additional help to the textile industry in such diverse forms as molded bearings, flyer-blocks and floating condensers in drawing and roving frames.

New aids in the winding and twisting of synthetic yarns were the magnetic tension control device made by the Universal Winding Company and such improvements in the U. S. Acme double-deck twister as the spindle swing unit, balloon separators and Dow metal traverse bars in place of wood.

Improved rayon soaking and extracting were claimed by the use of a new Johnson Engineering Company unit and the Fletcher removable basket extractor.

As further assistance to those processors of rayon cakes were the novel non-returnable paper covers developed by the American Viscose Corporation replacing the conventional knitted covers.[3]

Slashing, Weaving and Knitting

In the field of slashing, improved warp sizing was claimed by the inventors of a patented process for the application of a sizing lubricator at the slasher. The Uxbridge Worsted Company's new high-speed drying unit for slashers showed promise of having many advantages over the usual heated cylinder type of equipment.

A newcomer among the domestic manufacturers was the Coastal Machine Company, engaged in building the new Baker automatic woolen and worsted loom to weave on conventional principles but with improvements to permit higher speeds.

The Hunt Machine Works continued to manufacture a loom patterned after the old Model "E" Draper but with increased operating speed.

Interest in warp knit goods continued to grow, and the Robert Reiner Company offered a new three-bar tricot machine to operate at 320 courses per minute on a variety of designs.

A new circular knitting machine by Supreme Knitting Machine Company featured an automatic variable striper that promised to open a new field in knit goods for women's wear, upholstery and novelty fabrics.

Foreign Developments

A number of interesting foreign developments in textile machinery were noted during 1948. A frame for spinning cotton yarns directly from drawn sliver, operating with a draft of from 200 to 250 with resultant savings in labor, maintenance and power was manufactured in Milan, Italy by the Nastrofil Company.

A new ring doubling and twisting machine made by Ernest Scragg and Sons, Ltd., of Macclesfield, England featured new broken-end stop-motion, feed-roller and spindle mounting. This concern also produced new double-deck uptwisting and high speed spindleless redrawing machines.

From Japan came the report of a new method for the wet-spinning of yarns from wool fibers shorter than 20 mm. in length, and a new system of roll weighting with piano wire spring, providing smooth uniform pressure with little or no vibration.

A moveable spindle rail manufactured by a Swiss firm was claimed to keep yarn tension constant, reduce end breakage and improve yarn evenness.

To attract the interest of American weavers and equipment manufacturers, the French Fayolle-Ancet eight-shuttle circular weaving machine with a productive capacity equal to three times that of a standard loom was exhibited in operation at a Long Island mill.

The preliminary announcement of a unique centrifugal worsted spinning system by Prince-Smith and Stells, Ltd., made early last year, probably escaped the notice of a good many mill men, but wide-spread publicity and full details disclosed only a few months ago received considerable attention both here and abroad.

"Fabronized" textile roller clearers with surfaces made of sprayed fiber flock were produced by an English company.

Patents

Among the more interesting patents issued were those covering improved yarn guiding reeds on high speed warpers, a process for producing a web of oriented parallelized staple fibers by the action of electro-static field, a cotton bale-mixing and opening machine, and an automatic spinning frame doffing device. In the bonded fabrics field a new machine for forming random dispersed fiber webs was described in a recent patent. Evidence of more than passing interest in this particular equipment was indicated in the report that this machine along with newly designed supplementary feeder equipment was to be manufactured for distribution to the trade by a New York state machine tool company. What might be facetiously described as another "blow" to the manufacturers of conventional textile machines in an apparatus for spinning textile fibers through the use of a cyclone chamber and high pressure air jets to subject the fibers to a swirling motion which eventually produces a spun yarn. This unusual equipment was patented by a Los Angeles textile engineer, but no exhibit of the end-product or disclosure of manufacturing details have yet been made by the inventor.

3. Finished Goods

Dyestuffs and Finishes

What was said to be a completely new cotton dyestuff possessing good fastness to washing and light was the new Alcian Blue introduced about a year ago by Imperial Chemical Industries, Ltd.

According to announcements, about 90 new dyestuffs and pigments were offered by domestic manufacturers during the year, along with over 150 new chemical auxiliaries.

New anti-static agents for yarns and fabrics, particularly suited for nlyon or Vinyon, were made available by at least three chemical companies.

Increasing interest was shown in wrinkle-resistant cottons and another contender for the fair hand of the Maid of Cotton was the American Cyanamid Company's "Superset" melamine resin finish for imparting stability to washing and resistance to creasing.[4]

"Coronizing" was the name assigned by the Owens-Corning Fiberglas Corporation to their new process for imparting a permanent soft hand and draping characteristics to Fiberglas fabrics.[5]

Offset printing of textile fabrics at low cost and in colors resistant to sunlight fading and severe laundering was made possible with the formulation of special inks by a North Carolina Company, while a new group of stabilized azoic dyes requiring acid ageing promised improved colorfastness in bright color cotton prints. The problem of obtaining better dyefastness on cellulose acetate fabrics without saponification received further encouragement with the introduction of new acid dyestuff solvent methods by a large chemical company.

Like the antidote following the poison, now that progress has been made in the application of dyestuffs to nylon, the Mathieson Chemical Corporation has found a way to correct our mistakes with "Textone", a new material to be used for the partial or complete removal of dyestuff from nylon.[6]

In the processing of woolen fabrics, the use of chemical methods for obtaining shrink-resistance has not been as widespread as was predicted a year ago, but research efforts to obtain foolproof results continue.

Methods and Equipment

Through the application of a double printing process, a New England print works stated that they had created fine tropical worsted and tweed effects on popular priced cottons. Savings in fuel and the elimination of dyebath dilution and noise vibration were the outstanding features of the DeWolf Corporation cylindrical shaped heat exchanger for applying heat to dye-tubes. Among British patents issued during the year was one to a New Jersey bleachery involving the application of electric current during a continuous vat dyeing process to complete reduction of the dyestuff to its soluble form, effecting quick, uniform penetration of the fibers. Another British patent covered the finishing of fabrics composed of equal parts of cellulose acetate staple fiber and wool, whereby steeping in 40% acetic acid produced an increased proportion of wool on the surface of such fabric.

Also from England was issued the report of a new printing process whereby a large number of colors can be put on one roll, but no further details have been forthcoming.[7]

Recognizing the demand for equipment to heat-set and at the same time improve the hand of all nylon woven goods, one manufacturer designed a new heat-treating machine with six internally heated cylinders and automatic temperature control.

Early in the year the Rodney Hunt Machine Company introduced its "Tensitrol" system for processing all kinds of fabrics at high speed without tension. A new stainless steel wool top dyeing machine said to eliminate the need for recombing after dyeing was announced by the Allen-Worcester Company. The Tootal, Broadhurst, Lee Company of Manchester, England used electric eye controls for guiding material into a pin tenter[8] and a similar electronic device based on a patented reflected-light principle of control was utilized by a Rhode Island firm in a new model filling straightener.

The "Duplex" continuous dyeing machine was acclaimed for its ability to produce uniform shades on pieces of varying length and for its all-around versatility in giving maximum production with a minimum of effort and cost.

4. Laboratory Instruments and Techniques

An improved version of the yarn evenness tester unveiled in 1947 by the Standard Electronics Research Corporation was the new SERC Electron Micrometer now adapted for recording yarn diameters continuously. Through the incorporation of new circuits it is also possible to record high and low values on two automatic counters if the graphical record is not required. A new Italian-made automatic yarn testing machine provides a continuous record of breaking strength and elongation, not too unlike the English Moscrop tester. For visual inspection of yarns, a southern mill suggested the use of a wide 29" diameter black cylinder. A yarn lubricity tester designed by the Nopco Chemical Company was being manufactured and offered for sale by the U. S. Testing Company.

After extensive inter-laboratory tests, the Technical Committee for Recommended Commercial Standard TS-4350 on Flammability of Textiles agreed that existing laboratory apparatus was not yet accurate enough to be used for reference in Federal or State legislation.

Typical of the textile technician's appreciation of the inadequacies of many established test procedures were two improved methods proposed for the evaluation of wetting agents, and newly designed apparatus for appraising the crease-resistance of resin-treated fabrics. Additional new testing techniques recommended for consideration were one for determining wool grade very quickly by sedimentation and another for measuring cotton fiber strength by a modified flat bundle test.

The serviceability of textile materials in certain types of wearing apparel is still of prime importance, and technicians continued to try to improve existing test methods or devise new ones which would predict fabric success or failure. Research workers have evolved an orifice test to measure yarn for swelling properties when wet and a new hydrodyanamic test for water resistance which can be correlated with rainfall intensity.

The resistance of yarns and fabrics to abrasion is still the subject of much investigation and controversy. One of the newest laboratory instruments which may predict clothing serviceability is the Stoll-Quartermaster Universal Wear Tester designed at the Q.M. Textile Materials Engineering Laboratory to produce flat, edge and flex abrasion on any specimen.

Complete text of British tentative standard methods for identifying textile materials was published in the Journal of the Textile Institute, while in this country a new approach was the use of spectrographic analytical technique for the identification of finishes and their reactions with various fibers, described in a paper presented at the annual meeting of the American Association of Textile Chemists and Colorists. For measuring exact color differences, a photo-electric "Color Eye"

was designed in the research laboratories of the Pittsburgh Plate Glass Company. Modified short-cut methods were proposed for testing the resistance of dyed cellulose acetate fabrics to atmospheric fading and colorfastness to perspiration, but they have not yet been adopted by the A.A.T.C.C.

Technicians engaged in more fundamental studies will be interested in a report from the Bureau of Standards giving details of a new shadowed replica technique for studying details of wool fibers by the electron microscope.[9]

X-Ray tracer methods were applied to fiber processing study at the Institute of Textile Technology, and examples of probable application of the use of radioactive atoms in textile research were suggested in a recent article in the Textile World.

In an attempt to achieve agreement on textile testing methods and standards, the International Organization for Standardization, Committee 38 on Textiles, sponsored a meeting in Buxton, England last June which was attended by delegates from 13 nations including a representative group from this country.[10]

5. Research Organization Activities

In addition to making further investigations of chemical and physical damage and the mechanical properties of fibers, the Textile Research Institute at Princeton, New Jersey initiated two long-term sponsored research projects, one on the fundamentals of the dyeing process and the other on the basic characteristics of wool. The Institute of Textile Technology at Charlottesville, Virginia continued to receive wide industry support and made substantial increases in laboratory facilities and technical personnel.

In launching a campaign for increased Corporate Membership, the American Association of Textile Chemists and Colorists reviewed committee accomplishments during the past year and proposed to enlarge their program of research by the staff maintained at the Lowell Textile Institute.

A new million dollar research center of the Cluett, Peabody & Co., Inc. at Troy, New York with provisions for fundamental chemical and physical studies of fibers, fabrics and finishes, and complete pilot plants for spinning, weaving, dyeing and finishing was formally opened last Fall.[11]

Organizations such as the Mellon Institute, the Armour Research Foundation, the Southern Research Institute and others reported research activity on problems pertaining to warp sizing, bonded fabrics, fabric shrinkage control and fiber processing. The Research and Marketing Act of 1946 provided about one million dollars for cotton fiber research for the fiscal year 1948, representing a 20 per cent increase in expenditures by all federal, state and private agencies.

In England, the British Wool Industry Surplus Cloth Corporation allotted $160,000 toward founding a chair of Wool Textile Machinery Research at Leeds University, the International Wool Secretariat granted an additional $40,000 to the same school for new wool research laboratories, and the new British Rayon Research Association was getting under way. The famous Shirley Institute announced plans for new laboratory buildings and the Wool Industries Research Association presented a five-year development plan to cost almost one million dollars. The Linen Industries Research Association stated that activities would be increased in research studies of rayon staple fiber spinning on flax machinery, the suitability of flax machines for spinning wool and the application of crease-resistant finishes.

6. Future Developments

Greater demands for new synthetic fibers for industrial fabrics seem inevitable since the existing natural and man-made fibers and yarns fail to meet the rigid requirements of resistance to high temperatures and all kinds of chemicals in liquid and vapor states. Research workers are now exploring the possibilities of spinning fibers and yarns from some of the newer resins, but the very desirable properties of insolubility, chemical inertness and high melting points make the problems of finding new solvents, plasticizers and spinning methods extremely complex.

It is probably only a matter of time before the speedy continuous spinning methods of making viscose process rayons of greater uniformity will constitute an important part of the world's production, although costly changeovers are definitely a hindrance to more rapid development. The patent literature reveals some of the thinking on the part of progressive manufacturers who plan to stay in the running with their competitors. In the processing of rayon yarns the trend is definitely toward the use of larger packages and higher speeds, but such changes will be made only when it has been proven that yarn and fabric quality can be improved at the same time. In twisting it is very likely that the use of some type of the "two-for-one" twister will be given serious consideration.

With several companies now engaged in the manufacture of silicones on a large scale, it is probable that we shall see more aggressive promotion of their application as durable water repellent finishes for all types of textile materials.

In conclusion, we need not be ashamed of the textile research achievements in 1948. We are confident that further progress in 1949 is inevitable.

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1. *See Textile Colorist and Converter December*, 1948.
2. *Ibid., August and December*, 1948.
3. *Ibid., August*, 1948.
4. *Ibid., September*, 1948.
5. *Textile Colorist and Converter Section, A.D.R., January* 10, 1949.
6. *Textile Colorist and Converter, December*, 1948.
7. *Ibid., March*, 1948.
8. *Ibid., November*, 1948.
9. *Ibid., August*, 1948.
10. *Ibid., November*, 1948.
11. *Ibid., December*, 1948.

OBITUARY

Laurence G. Meads, formerly President of Aridye Corporation and since 1946 President of Murphy Paint Division of Interchemical Corporation, died at Roosevelt Hospital on January 12, 1949, after a short illness.

Mr. Meads resided at 32 Washington Square, New York, having moved there early last year from Ridgewood, New Jersey, where he lived for many years. He was born on March 17, 1892, at Buffalo, New York. He was graduated from Cornell University in the Class of 1914.

Mr. Meads was at one time an instructor of Military Science at Cornell University and enlisted in World War I in 1917, attaining the rank of captain.

After the war, he entered the advertising business and became a partner of the Blackman Company. He left the Blackman Company in 1933 to become an executive of Interchemical Corporation and Aridye Corporation, a subsidiary. At one time, he was President of the Board of the Y. M. C. A. in Ridgewood, New Jersey; and was a member of the Cornell Club, the Union League Club of New York and Rotary Club.

He is survived by his wife, Mrs. Gertrude Hay Meads of 32 Washington Square; a son, Donald E. Meads of Ridgewood, New Jersey; a daughter, Mrs. Harry C. Hoyt, Jr., of Wellesley, Massachusetts; a sister, Mrs. L. C. Tyrrell of Berkely, California; and five grandchildren.

New Services, Projects, Businesses

ONYX OIL & CHEMICAL COMPANY, Jersey City 2, N. J., announces publication of Technical Data Report No. 19-T "Onyxol 9162 in the Scouring of Wool". This report covers a series of experiments in wool scouring with Onyxol 9162, a new synthetic detergent. The results of tests at the Lowell Textile Institute and of subsequent large scale runs in regular mill equipment are said to indicate that the product can be counted on to produce superior quality scoured wools on a more satisfactory production basis and at over-all scouring costs which are equal to or better than those involved in the use of high grade soap. The chemical and physical characteristics of Onyxol 9162, together with its other textile applications, are covered in detail in Onyx Technical Data Sheet No. 21-T.

THE AMERICAN CHEMICAL SOCIETY will hold its 115th national meeting in San Francisco from March 28th to April 1, it is announced by Dr. Linus Pauling, president of the Society and head of the department of chemistry and chemical engineering at the California Institute of Technology. Several hundred technical papers describing advances in textile chemistry, as well as virtually every other major field of chemical science and technology will be presented at sessions of seventeen professional Divisions of the Society.

A MILLION-DOLLAR RAYON WEAVING MILL will start operations in Machias, Me., this month or next, according to its president, WALTER B. GALLANT of Newmarket, N. H. The Machias Manufacturing Co. will be the first of its kind in the region, will employ about 120 workers, and will have a payroll of about $300,000 a year, Mr. Gallant said. The mill is an affiliate of Newmarket Manufacturing Co., Lowell, Mass.

CROSLAND & PICKSTONE, LTD., dyer and finisher of Bury, Lancashire, England, is planning to use the "Everglaze" process of Joseph Bancroft & Sons Co. for large scale production, it is learned. According to an official, they have already started on a large quantity of overall fabric and intend to use the process later for rainwear, corset cloths, dress fabrics, children's wear, beach wear and furnishings.

THE TEXTILE INSTITUTE OF FAIRLEIGH DICKINSON COLLEGE, Rutherford, N. J., offered an evening of films, discussions, and exhibits for textile students and those interested in the field on Monday, January 24, 1949, at 7 p.m. in Becton Hall on the campus. James W. Cox, consulting textile engineer of New York City, gave the principal address on "Progress in the Textile Industry."

A feature of the evening was sound and color films on textiles as follows: "Harnessing the Rainbow," through the courtesy of the Dupont company, Wilmington; "Careers for Cellulose," through the courtesy of Hercules Power, Wilmington; "Botany Clothes the Nation," a Botany Mills Film; and "From Cotton to Cutter," a Reeves Brothers, New York, film.

An exhibit of a model range of finishing and dyeing machines was arranged by the United Piece Dye Works of Lodi. The raw materials class at the college arranged for an exhibit of samples of textile raw materials.

Members of all five classes of the Institute at the college participated in the program under the direction of the following instructors: Dr. Herbert Mauersberger, raw materials; Charles Minoff, textile chemistry; George Decnyf, dyeing and printing; Dr. Marcel J. Pagerie, finishing; and Gordon R. Turner, identification, texting, and analysis.

The textile courses at the college were set up by a committee which includes the following: Carl A. Brubacker, Standard Bleachery and Printing, Carlton Hill; George Decnyf, United Piece Dye Works, Lodi; Marinus C. Galanti, also of United Piece; F. R. Haigh, Botany Mills, Passaic; Charles Minoff, Martex Printing, Clifton; F. W. Noechel, Botany Mills; Dr. Marcel J. Pagerie, Allied Textile Printers, Paterson; Francis S. Richardson, Waldrich company, Delawanna; Dr. Werner Von Bergen, Forstmann Woolen company, Passaic; and Dr. Herbert Mauersberger, Textile Printing, New York City.

THE ASSOCIATION OF COTTON TEXTILE MERCHANTS OF NEW YORK held its annual forum and dinner Friday afternoon and evening, January 28, at the Ritz-Carlton Hotel, New York. Speakers at the event included Philip D. Reed, chairman of the board of General Electric Company; Murray Shields, vice president of the Bank of the Manhattan Company, and Arthur Besse, president of the National Association of Wool Manufacturers. The committee on arrangements for the dinner consisted of Richard G. Conant of Wellington Sears Company, John M. Hughlett of Dan River Mills, Inc., and Herman D. Ruhm of Bates Fabrics, Inc.

A NEW FLUORINE CONTAINING HYDROCARBON is currently offered by the Hooker Electrochemical Company, Niagara Falls, New York. 3-Nitro-4-chlorobenzotrifluoride ($C_6H_3CF_3$[3-NO_2, 4-Cl]) will be of special interest to researchers and manufacturers of dyes and intermediates. The compound is a thin oily liquid with an aromatic odor. The trifluoromethyl group is chemically stable, but the nitro group may be reduced and the chloro group may be replaced. Its molecular weight is 225.5; freezing point is −7.5°C; boiling point is 222°C; and specific gravity is 1.542. Technical Data Sheet No. 367 is available to describe the compound more completely.

NATIONAL CARBON COMPANY'S "KARBATE" SEVEN-TUBE IMPERVIOUS GRAPHITE SHELL AND TUBE HEAT EXCHANGER, SERIES 70A, as a redesign of the previous Series 70, has been announced, thus augmenting the usefulness of this exchanger. The basic elements of the new unit may be converted from a single pass to a double pass unit by a simple change of covers. The exchanger can better be adjusted by varying rates of flow and amounts of liquid handled. This feature gives the unit added utility without affecting its original efficiency.Replacement of tubes may now be made quickly and easily in the field, thus eliminating the necessity of blocking off tubes and thereby reducing capacity. Two sizes, having effective outside tube areas of 16.4 sq. ft. and 24.6 sq. ft. are carried in stock. "Karbate" Shell And Tube Heat Exchangers, Series 70A, are manufactured by National Carbon Company, Inc., 30 East 42nd Street, New York 17, N. Y.

OF interest to the textile dyers and finishers are big documents described by the Commerce Department as the "world's most complete dye color catalogues."

Prepared by I.G. Farbenindustrie of Germany, they were said by John C. Green, Director of the department's Office of Technical Services to be available to "interested American firms on a no-charge loan basis."

Fifty-seven volumes contain dyed samples of bleached and unbleached cotton, rayon, silk, weighted silk, silk and cotton, etc.

Dyes used include Napthol A.A., Indanthrene, immedial, substantive, chrome, acid, Celliton, Palatine, Rongalit, Sirius and other types.

Concentrations of the impregnating and developing baths are given as well as the fastness properties of the dyes and notes on the choice of suitable dyestuffs for various purposes. Most of the text is in German.

A list of the specific volumes, indicating the contents of each, appears in the August 1948 issue of the "Bibliography of Scientific and Industrial Reports," available from the Office of Technical Services at $1 per copy.

Mr. Green asked firms interested in borrowing the collection to write him in care of the Office of Technical Services, Commerce Department, Washington 25, D. C. Each firm will be entitled to a 30-day loan on a first-come first-served basis, with shipping charges to and from the firm to be paid by the user.

INITIAL REPORTS FROM USERS OF SULFRAMIN E LIQUID—the latest development of Ultra Chemical Works, Inc., Paterson, New Jersey, indicate that the synthetic detergent lives up to the startling claims originally made by the company, according to a company statement.

Sulframin E Liquid is a modified alkyl aryl liquid, having exceptional hard-water and lime-soap stability as well as excellent foaming, wetting, and detergent qualities. It is very stable and more effective in the presence of acids and alkalis than other alkyl aryl sulfonates. Sulframin E, prepared as a clear amber-colored liquid, is available in drums, tankwagons, and tankcars.

NEW POLICY OF WARP AND WEFT — the company magazine of Brighton Textile Mills published for about five years, has been announced by Julian K. Morrison, president of the firm. Beginning with the January 1949 issue, all fashions illustrated in the magazine are the result of advance selections by a monthly guest merchandising panel composed of fashion editors, retail buyers, merchandise managers and heads of resident buying offices.

The January issue, first in the new format, had as its guest editors Mrs. Edith Braswell Evans, coordinating director of *Mademoiselle*, Miss Mary Prepp of Kirby, Block and Co., resident buyers, Miss Betty Sutherland, dress buyer for Stix, Baer and Fuller of St. Louis, and Miss Ruth M. Peoples, dress buyer for B. Altman & Co.

The group chose clothes by ten leading designers to be represented in the magazine. They are: Maria Krum, Trigere, Hannah Troy, Joan Norton Irwin, Carolyn Schnurer, Benfatto & Kallman, Encore Dress, Janet Taylor, Fred Greenberg and Duchess Royal.

The February issue's guest panel was also announced by Mr. Morrison. They are: Miss Mary Lewis of Mary Lewis, Inc., Melvin E. Dawley, vice-president and merchandise manager of Lord & Taylor, Mrs. Lucia Baldwin Foreman, merchandising editor of Charm Magazine.

THE TENTH ANNUAL NATION-WIDE AMERICAN FASHIONS COMPETITION—with prizes totaling $4,750, opened Jan. 2. The contest, sponsored annually by the Chicago Tribune to encourage talent in American fashion designing, is open to both amateur and professional designers. Original sketches or drawings of any article or ensemble of women's outer wearing apparel suitable for introduction in the American market must be mailed to contest headquarters before 5 p.m. April 18 in order to be eligible for the judging. At least 25 preliminary prize-winners will be selected by a Tribune fashion jury headed by Mrs. Grace Pickering, contest director, for $50 preliminary awards. Actual costumes made up by expert dressmakers from these preliminary prize designs will be modeled by widely-known cover girls and professional models for the final judging at which winners of $2,000, $1,000, and $500 grand prizes will be named. Color photographs of the prize costumes will be reproduced in the Tribune. Complete rules for the contest can be obtained by writing to the 1949 American Fashions Competition, Chicago Tribune, 435 N. Michigan Ave., Chicago 11, Ill.

COLOR — was the theme of the San Francisco designed styles which left recently on board the Matson liner LURLINE for a round-trip cruise to Hawaii. The reason for the emphasis on color might be attributed to the fact that the clothing was used in a series of color movie sequences taken by Warner-Pathe aboard the liner. . . . but it's also the prediction of San Francisco manufacturers for styles for this coming Spring.

Prominent among the colors were red. . . . red rusts. . . . . purple reds; bright gay yellows; neutral tones. . . . sands and beige as well as stark, dramatic white; blues, shading from navy and deepest royal blue to soft pastel hues; browns of light cinnamon tones and deeper shades; greens. . . . jade, emerald, marine green; deep grey, pearl grey, cloud grey; plaids and prints in every known combination.

Fabrics included imported silks, domestic rayons, laces, nets, organdies, satins, faille, chiffons, marquisettes, jerseys, taffetas, sharkskins, Swiss silk tissues, satin brocades, eyelet piques, waffle piques, chambrays, denims, butcher linens, picolays, pongees, gabardines, worsteds, suedes and doeskin.

Among the style trends noted were the use of dramatic white fabrics in coats and suits, with denim taking on more and more high color. Bright red denims, blue denims, grey denims and even iridescent denims were abundantly represented in the collection. The conventional faded blue denim is still present but seems to have taken a back seat for the more prominent gayly-colored interpretation.

Iridescent fabrics are imported—not only in denim but also in many other types of cotton.

Personnel

Tennessee Eastman Corporation announces the appointment of DUNCAN G. CARMICHAEL above, as technical representative for Eastman Acetate Dyestuffs, with headquarters at the plant in Kingsport, Tennessee. The new position is designated as a liaison between Tennessee Eastman's dye customers and its sales production staffs, and was created to promote improved dyestuffs sales service.

Mr. Carmichael's background includes wide practical and technical experience in the application of dyes to textiles as a result of many years in the field. A graduate of Temple University and Philadelphia Textile Institute, he was technical director at Aralac Technical Laboratories for four years prior to coming to Tennessee Eastman. Previously, he had been with Ciba Company, Ontario Dye Works, E. L. Mansure Company, and the Hellwig Dyeing Company. His work with these companies was on application, research, manufacture, and dye sales service.

DR. ROBERT SIMHA, consultant on organic and fibrous materials at the National Bureau of Standards, has received the A. Cressy Morrison Prize of the New York Academy of Sciences for a paper entitled "The Effect of Concentration on the Viscosity of Dilute Solutions." Dr. Simha has achieved international recognition for his research in rheological and solution properties of high polymers, such as synthetic fibers, cotton, silk, wools, plastics, synthetic rubber, and biological viruses. He has just returned from Europe, where he spent several months visiting laboratories where high polymer research is in progress. During this time he was guest lecturer for a number of universities, including the University of Stockholm and the Institute of Physical Chemistry in Basel. The paper for which Dr. Simha was awarded the Morrison prize for 1948 examines, by a new hydrodynamic method, the viscosity of a dilute solution of dumbbell-shaped molecules and considers the extension of the new method to a pearl-string model currently used by various authors to represent polymer molecules in solution.

DR. CARY R. WAGNER, Vice President of General Aniline & Film Corporation in Charge of Operations announces that DR. STILES M. ROBERTS, who is Section Leader of the Triphenyl Methane Dye Section at the Rensselaer, N. Y. plant, has been appointed Associate Director at the Central Research Laboratory, Easton, Pa., in charge of the Textile Auxiliaries Section, the Azo Dye Section, the Intermediates Group, the Vat Dye Group, and the Dyetesting Laboratory.

WILLIAM H. SCHOELLHORN is the new Southern representative of Commonwealth Color & Chemical Co. having been transferred to that post from their Chicago Office. He replaces Keith A. Bragg who returned to his home in Fort Wayne, Ind. to enter the furniture business.

JAY D. RUNKLE—Chairman of the Board of Directors of the National Retail Dry Goods Association, was presented January 10 with a citation for meritorious service by retailers during the United States Treasury Department's U. S. Savings Bonds Campaign. Mr. Vernon Clark, National Director of the United States Savings Bonds Campaign and Assistant Secretary of the Treasury, made the presentation to Mr. Runkle, who accepted it in behalf of all retailers and who indicated that retailing is always prepared to bend its every effort towards the nation's welfare.

JOSEPH G. DONHARL has been named sales representative in Georgia, Tennessee, Alabama and Mississippi for the Textile Chemicals Division of L. Sonneborn Sons, Inc., New York, according to a recent announcement by S. G. Slavin, sales manager of the division. Mr. Donharl, who has had considerable experience in all phases of textile processing and finishing in wool, rayon and cotton mills, was formerly associated with American Cyanamid Company and with Rohm & Haas Company. He took over his new duties February 1 as a representative of Sonneborn's complete line of processing specialties.

FRED NOECHEL — has resigned as chief of the physical laboratories of Botany Mills, Inc. to accept a new position in the south. He has been with Botany for 22 years. His new connection will be announced shortly.

DR. JAMES H. WAKELIN—joined Textile Research Institute, Inc., and the Textile Foundation as associate director of research beginning February 1. Dr. John H. Dillon is director of research for both organizations.

CHARLES K. SEID—has resigned as vice president and general manager of Peerless Mills, New York and Pawtucket. He was with Peerless for the past two years, and prior to that was for 16 years sales manager of American Bemberg Corporation. Earlier, he was the first sales manager of the Fabrics division of Celanese Corp. of America for six years. He will announce his plans later.

JESSE A. WHITE—of Slater, S. C., will succeed WILLIAM J. ERWIN, who has resigned as vice-president of J. P. Stevens & Co., Inc., and executive officer of the Republic Cotton Mills, division of Stevens at Great Falls. Mr. Erwin has become vice-president and

director of Reigel Textile Corp. and general manager of the company's division at Ware Shoals. Mr. White has been plant manager of the Slater Manufacturing Co. at Slater, a division of Stevens, for a number of years.

THE NATIONAL RETAIL DRY GOODS ASSOCIATION'S officers for the year 1949 are as follows: Chairman of the Board of Directors: CHARLES G. NICHOLS, President & General Manager, The G. M. McKelvey Company, Youngstown, Ohio; Chairman of the Executive Committee: GEORGE HANSEN, President, Chandler & Company, Boston; President & Treasurer: LEW HAHN; Vice Chairman of the Board of Directors for the New England States: CARL N. SCHMALZ, President & Treasurer, R. H. Stearns Company, Boston. For the Mid-Atlantic States: IRWIN D. WOLF, Vice President, Kaufmann Department Stores, Pittsburgh. For the Southern States: DAVID OVENS, Vice President & General Manager, J. B. Ivey & Company, Charlotte, North Carolina. For the Middle Western States: RALPH T. FRIEDMANN, Vice President, Ed. Schuster & Company, Inc., Milwaukee. For the Western States: IRA K. YOUNG, Vice President & General Manager, The Crews-Beggs Dry Goods Company, Pueblo, Colorado. For the South Central States: GARY Y. VANDEVER, Vice President, The Vandever Dry Goods Company, Inc., Tulsa, Oklahoma.

Elected to NRDGA's Executive Committee are the following: GEORGE HANSEN, President, Chandler & Company, Boston; SARGENT F. EATON, President, The Howland Dry Goods Company, Bridgeport; GEORGE P. GABLE, President, The William P. Gable Company, Altoona, Pennsylvania; A. W. HUGHES, President, J. C. Penney Company Inc., New York; JAY D. RUNKLE, Vice President & General Manager, Crowley, Milner & Company, Detroit; THEODORE SCHLESINGER, Vice President, Allied Stores Corporation, New York.

The Executive Committee also contains ex-officio members as follows: CHARLES G. NICHOLS, Chairman of the Board; LEW HAHN, President; and an Advisory Committee of Ex-Presidents made up of BENJAMIN H. NAMM; EDWARD N. ALLEN; FRANK M. MAYFIELD. J. GORDON DAKINS will continue as General Manager & Assistant Treasurer and GORDON K. CREIGHTON as Assistant General Manager & Assistant Treasurer.

DOROTHY SHAVER, President of Lord & Taylor, will lead New York's apparel industry and the commercial and manufacturing fields related to it in the Red Cross 1949 campaign, it was announced by Brig. Gen. E. F. Jeffe, Greater New York Chairman of the appeal. Serving with Miss Shaver as group chairman are:

F. T. Small, Vice-President of the Celanese Corporation of America, Chairman of the textile industries group;

David R. Sadewsky, President of Junior League Frocks, Inc., Chairman of the clothing industry's manufacturing and wholesale group;

Steele L. Winterer, President of A. & M. Karagheusian, Inc., Chairman of the group embracing housewares, furnishings, rugs and giftware;

William M. Holmes, Chairman of the board of Jacqueline Cochran, Inc., Chairman of the retail group.

WILLIAM A. LANG will retire as manager of the Edwards division of Bates Manufacturing Co., effective March 3. HAROLD V. KING, general manager of the company's Hill and York divisions assumes responsibility of the Edwards division in Augusta, Me., and becomes its plant manager.

Converting Markets

(*Continued from Page* 137)

portant (from the standpoint of some converting markets), than the question of how sharpening competition is going to affect the future operations of the industry's biggest cotton fine goods vertical and the industry's biggest rayon goods vertical. Need I tell you that I am referring respectively to Berkshire Fine Spinners' and Burlington Mills?

J. Spencer Love's gigantic organization occasionally speaks out loudly and provocatively on the whole matter of vertical distribution, doing so via its bright, breezy and voluminous advertising. Skeptics have always been most skeptical about the ability of big-time integrations to move flexibly and rapidly enough in fashion market merchandising. On this point, one of the Burlington's recent ads boldly boasted:

You've got to have your ear to the ground—your nose to the grindstone—and you've got to be fast. We are. We don't just print prints. We publish them.

And then, with regard to the whole question of mounting competition, another of their ads proclaimed:

The hat's in the ring. The challenge is here. As a producing nation, we have now to prove our ability to distribute our postwar productive capacity in a buyer's market. In some fields we have already seen minor crises of unabsorbed inventories piling up. This has not been due to lack of consumer buying power, but rather to lack of the fire and imagination to capture public interest.

Despite the cleverness of such copy, there are still many market skeptics who doubt that big-time integration will be able to measure up to the competitive "challenge" in the long run. These people cling to the traditional argument that the sheer weight of mass production and the hazards of stock-carrying will eventually force dress goods verticals to revive gray goods selling.

And it is true that in the past 18 months a number of the smaller wartime integrations have reverted to their former selling policies. Only the largest of them all are holding to the sale of finished goods, a statement of fact which probably makes life a little uncomfortable for the theorists who have always contended that great size is the No. 1 handicap to forward integration.

It is even more interesting to find a few market voices that are not presently joining in the skeptics' chorus. For example, I have a friend who is one of the shrewdest competitors of big-time rayon goods integration. He is willing to wager that the abilities of one or two management personalities will carry the largest of the verticals to ultimate success. Now, on the face of it, this sounds like a weak type of reasoning. Let's look at it very closely:

(a) it is not in fact a defense of the theory of integration as such; but

(b) it *is* a statement of confidence in the infallibility of one or two of the personalities behind big-time integration.

My opinion is that the biggest of the integrations would want to run away from any theory of personal infallibility as fast as their feet could carry them. Actually, we can see from recent news reports that they are doing just that. For example, Burlington has just effectuated further decentralization of its various merchandising divisions. Each division selling finished apparel fabrics, it would appear, is now required to justify its own existence.

Now do you see why I find this subject of textile integrations is so fascinating? It's a battle of wits as well as of theories.

Until the next time,

BILL LAWRENCE

These are New...

A PROCESS FOR DYEING NYLON FIBERS WITH DIRECT COTTON DYESTUFFS was issued by the U. S. Patent Office to James Hutchinson MacGregor, Bocking, Braintree, England, assignor to Courtaulds, Ltd., London. The Patent Office description points out that direct cotton dyestuffs have little affinity for nylon. The process, therefore, provides for an enhanced rate of absorption by the nylon fiber of the cotton dyestuffs by incorporating into them a water-insoluble condensation product.

A NEW SYNTHETIC DETERGENT OF THE ALKYL ARYL SULPHONATE TYPE, KAMENOL D, has been introduced by the Kamen Soap Products Co., Inc., of New York and Barberton, Ohio. The new product, according to A. Kamen, President, warrants a listing of "excellent detergency" in a recent tabulation of over 500 detergent compounds by one of the leading experts on synthetic detergents.

Kamenol D is a "soapless" soap for hard or soft water in white bead or slurry paste form which is good in salt solutions. It is stated that it has high active ingredients which are clear and soluble in hard or soft water of all proportions. It is said to be active in extremely low concentrations and non-irritating to the skin and to form rich foaming suds and has excellent dispersing properties.

THE INSTALLATION OF A NEW STAINLESS STEEL RESIN-PRODUCTION UNIT has been announced by Synthron, Inc. at its plant in Ashton, R. I. The addition of this unit will increase production capacity of urea-formaldehyde resins by more than 5 million pounds per year, and will enable Synthron to keep pace with the rapidly expanding usage of Synthrez D (monomeric methylolurea compound for crushproofing and shrinkage control) in the textile industry, it is claimed.

A NEW TECHNIQUE that is said to make it possible to quickly provide special custom dyed colors for narrow braid used in manufacture of men's summer hats has been announced by the O. Regen Manufacturing Company of New York. The technique was developed in association with American Cyanamid Company's Textile Resin Department.

The process makes use of pigment dyes which are resin bonded to the fabric and makes it possible to keep the woven braid on hand in the greige, and they can consequently turn out special color variations very quickly.

It is stated that the use of resins also has the plus value of adding to the braid the substance and body formerly supplied by the addition of starch. Unlike starch, however, the resin is durable and does not become soggy in the rain.

The braid used is largely woven from rayon yarn, but the resin bonded pigment dyeing is also used successfully on cotton and mixtures of cotton and rayon.

A NEW ATTACHMENT FOR CONTINUOUS PROCESSING MACHINES that automatically imprints trademarks or distinctive designs on sheet or strip material traveling at speeds up to 900 feet per minute, has been developed by Adolph Gottscho, Inc., New York manufacturers of marking and code-dating equipment. The unit, which is actuated either by friction contact with the moving web or by connection to a convenient shaft on the machine to which it is attached, is known as the ROLAPRINTER.

Mounted on a calendaring, finishing or other continuous processing machine opposite a roller or idler that can serve as an impression cylinder, the ROLAPRINTER is said to make permanent "print-quality" impressions of consistent intensity on smooth and rough-finish woven fabrics, plain and waxed paper, boxboard, foil, glassine, cellophane and other plastic films, cured and uncured rubber, asphalted and rock products, linoleum, etc. during winding or roll-out of the material.

New fashion idea for the young set is the picture polo shirt above which is processed to permit a reproduction of an actual picture of each child on his or her shirt. This new line of children's polo shirts is a product of the Apco Manufacturing Co., of Chicago. The shirts are color fast and the pictures are not affected by washing. The first ad featuring the new shirt will appear in a February issue of Life.

SANDOZ PRESENTS *The color achievement of the month*

Perfect Match BY THE SHELTON LOOMS

So certain is The Shelton Looms of the fidelity of its Matched Kleersheen Colors that it makes this statement: "You're sure of a perfect color match in any combination of fabrics by The Shelton Looms."

In so doing, the mill expresses confidence not only in a "revolutionary process obtainable exclusively in pile fabrics by The Shelton Looms", but also in the ability of Sandoz to provide colors that are proven-fast and service-fast.

Among the Sandoz colors which find wide use on pile fabrics are

Azo Rubinole 3GP
Xylene Fast Yellow 2GP
Brilliant Alizarine Sky Blue BS
Brilliant Alizarine Milling Blue G
Alizarine Light Brown BL
Alizarine Light Grey RLL

a series of colors especially adapted for use on Mohair where long continued customer-use requires dyes of extreme fastness to light, perspiration and crocking.

And for any chrome, acid or direct dyes . . . or auxiliary chemicals . . . for both natural and synthetic fibres . . . be guided by the successful "color achievements" you see in these Sandoz advertisements.

SANDOZ CHEMICAL WORKS, INC., 61 VAN DAM STREET, NEW YORK 13, N. Y.
Application laboratories and stocks at Boston, Philadelphia, Charlotte, Chicago, Los Angeles, Toronto. • Other branches at Providence and Paterson.

SANDOZ *thinks ahead with textiles*

SANDOZ

DYESTUFFS
BICK & CO., INC.
READING, PA.
CHEMICALS

formula for the future
RESEARCH is opening up a fascinating vista of new processes and new products every day. For half a century, "Virginia" has been in the forefront of these developments. Your "Formula for the Future" may well be your specialized knowledge of your own business, plus "Virginia's" engineering resources, plus "Virginia" chemicals.
"Virginia" Liquid Sulfur Dioxide (SO_2), 99.98+ percent pure, is a superior antichlor for the finishing of cotton goods. It is easy to store, to handle, and to use. Send for folder today. VIRGINIA SMELTING COMPANY, West Norfolk, Virginia.
VIRGINIA
VIRGINIA Chemicals
NEW YORK BOSTON DETROIT
50 YEARS OF SERVICE TO INDUSTRY

ECLIPSE *Finish*

SPECIALISTS IN THE FINISHING OF
Ribbon • Lingerie and Blouses
Rayons • Acetates Mixtures

ECLIPSE PIECE DYE WORKS
35 EIGHTH STREET, PASSAIC, N. J.

FOR FAST PENETRATION
And to assure a
BETTER HAND —
Use

AQUAKAL 74

For Your Yarns and Fabrics

Aquakal 74 is the rapid penetrant and leveling agent that tops the list—by Draves Test and on your machines. Also used for rewetting in producing •SANFORIZED• fabrics.

Hydroxy Hand Cream — **for the operators handling nylon to keep their hands smooth.**

Two of a Full Line of Kali Textile Chemicals

KALI MANUFACTURING CO.
Manufacturing Chemists
427 Moyer Street • Philadelphia 25, Pa.

ORLEVAT BLUE BO

PASTE—QUAD POWDER—HIGH CONC. POWDER.
A deep full toned Navy for fast coloring of Cottons and Rayons by any Vat applications.

•

Recommended for printing and dyeing where effective resistance is necessary to light, washing, Peroxide Bleach and Chlorine.

ORLEANS COMPANY, INC.
45-24 PEARSON ST. • LONG ISLAND CITY • N. Y.

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Softness

use

Stanteosine

substantive softener

For lasting desirable softness on all fabrics and yarns.
No discoloration or odor development.

Minimum shade change and effect on light fastness.
Compatible with most finishing materials over wide pH range.

Permits controlled exhaustion from bath.

Write today for Stanteosine
Technical Data Sheet and Sample

STANDARD CHEMICAL PRODUCTS, Inc.

13th AND JEFFERSON STREETS, HOBOKEN, NEW JERSEY

CHATTANOOGA, TENN. PATERSON, N. J. PROVIDENCE, R. I. SUNBURY, PA.
SACRAMENTO, CAL. GREENSBORO, N. C. SALISBURY, N. C. LEAKSVILLE, N. C.

Rx FOR PREVENTING RUST on Knitting Machines

Zurn Heavy Metakote

Metakote is an exceptionally effective rust preventative—stainless, transparent and easy to apply. You simply brush Metakote on the metal parts of your full-fashioned machines, leaving a thick or thin coating as desired. Metakote has a neutral reaction —will not cause oxidation or discoloration, and is easily removed. Give your machines the protection they deserve with Zurn Heavy Metakote. Write.

Specialties for
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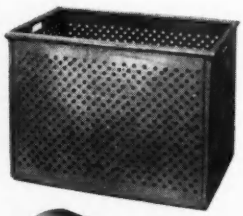
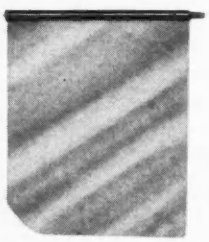
Oils for all textile conditioning requirements.

O. F. ZURN COMPANY
PHILADELPHIA 32, PA.
Knoxville, Tenn. • Hamilton, Ontario, Canada

CUT COSTS WITH *Stainless Steel*



Doffing Boxes and Dye Beck Reels



Cloth Reel

Separators

TEXTILE, dyeing and finishing plants can cut deeply into operational costs by replacing ordinary metal parts with stainless steel. Stainless steel is particularly effective in preventing metallic contamination or to keep colors running true in successive runs. Reduced repairs, expense of frequent changes and adjustments, resistance to corrosion . . . soon repays initial costs.

Whether your requirements be large tanks or small separators, stainless or carbon steel . . . *Truitt will fabricate it for you.* Refer your specific needs to us . . . our engineering services are available to you without obligation.

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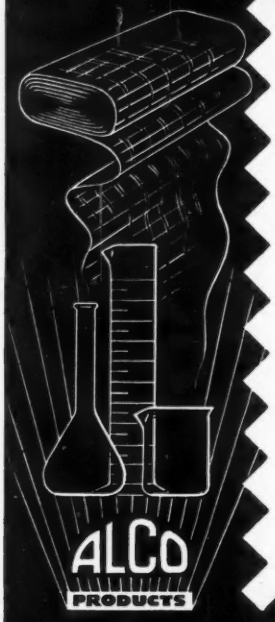
MANUFACTURING COMPANY
• GREENSBORO, NORTH CAROLINA •
Fabricators of Solid Stainless Steel and Stainless Clad Tanks • Dyeing Vats • Washing Tanks • Steam Drums • Storage Tanks for Acids and Alkalis • Mechanical Agitators • Separators • Stainless Steel Trucks • And Many Other Stainless Steel Products.



TRENAMINE D-25

..FOR SCOURING AND DYEING..

RUBBERIZED PILE FABRICS

ALCO OIL & CHEMICAL CORPORATION

TRENTON AVE. and WILLIAM ST., PHILADELPHIA 34, PA.

SOUTHERN DISTRIBUTORS
WICA COMPANY INC.
CHARLOTTE, N.C.

PURE **NICKEL** *Sheet, Strip, Plate, Rod, Wire, Tubing, Clad-steel, Castings.*

Users are surprised at its practical cost

Pure Nickel is kin to both the base metals and the precious metals. No other metal possesses its unique combination of so many different and uncommon properties.

- It is highly resistant to corrosives that destroy many other metals — alkalies, many acids, salts, organic compounds, fumes.
- It has mechanical properties like those of structural steel.
- Yet it is so ductile that it can be worked into the most intricate and delicate shapes that are practical in metal.
- It protects the purity of sensitive foods, beverages and pharmaceuticals against contamination.
- It often provides a faster rate of heat transfer than metals with equal heat conductivity.
- It can be exposed to temperatures ranging into yellow heat and even hotter in the absence of sulphur.
- At sub-zero temperatures its strength increases without change in ductility and toughness.

And one of the most valuable of all its features is the fact that Pure Nickel is a practical metal at a practical price.

Does it stimulate an idea of how you may find an easy answer to a difficult problem?

Our technical bulletin "Engineering Properties of Nickel" gives the important facts you want. It's yours for the asking.

The International Nickel Company, Inc.
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SEYER

SILK DYEING & FINISHING COMPANY

SEYER FINISH

THE MARK OF QUALITY

Commission Dyers and Finishers of Textile Fabrics

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NEW YORK OFFICE - - 140 WEST 42nd STREET

Excello FINISH

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INTERSTATE DYEING & FINISHING CORP.
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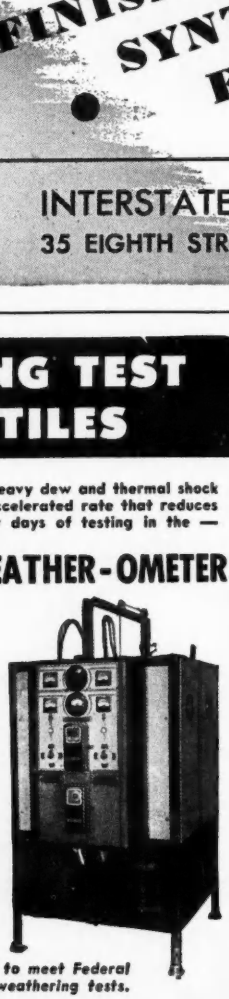
WEATHERING TEST FOR TEXTILES

Weathering effects of sunlight, rain, heavy dew and thermal shock reproduced in the laboratory at an accelerated rate that reduces years of actual weathering to a few days of testing in the —

ATLAS TWIN-ARC WEATHER-OMETER

The Twin-Arc Weather-Ometer has full automatic control of light and water periods. The Atlas Cycle Timer unit can be set to reproduce any combination of weathering conditions. A direct reading thermal regulator, automatic shut-off switch and a running time meter is included on the control panel. After setting exposure cycle on the control panel the Weather-Ometer is safe to be left in continuous operation over night without attention except to replace carbons once in 24 hours.



The Atlas Weather-Ometer is required to meet Federal Specifications demanding accelerated weathering tests.

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Originators and sole manufacturers for over a quarter of a century. . . . Weather-Ometers, Launder-Ometers, Fade-Ometers are the accepted standard accelerated testing machines all over the world.

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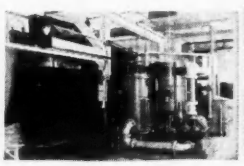
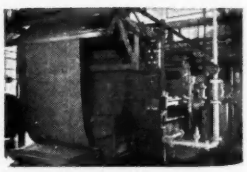


Installation in a New England mill making women's woolens.



Installation in a Maryland mill making cassimeres, flannels, tweeds and shetlands.

Fabrics now being handled by this machine include woolens, worsteds, rayon mixtures and mohair plushes. Although it involves a considerable investment and volume production, many machines are now in use. Constant improvement in design, greatly decreased solvent consumption and tremendous operating economies account for its popularity.

ADVANTAGES

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9. Little or no soap required.
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11. Possibilities in acid fulling of Derby Dry Cleaned fabrics.
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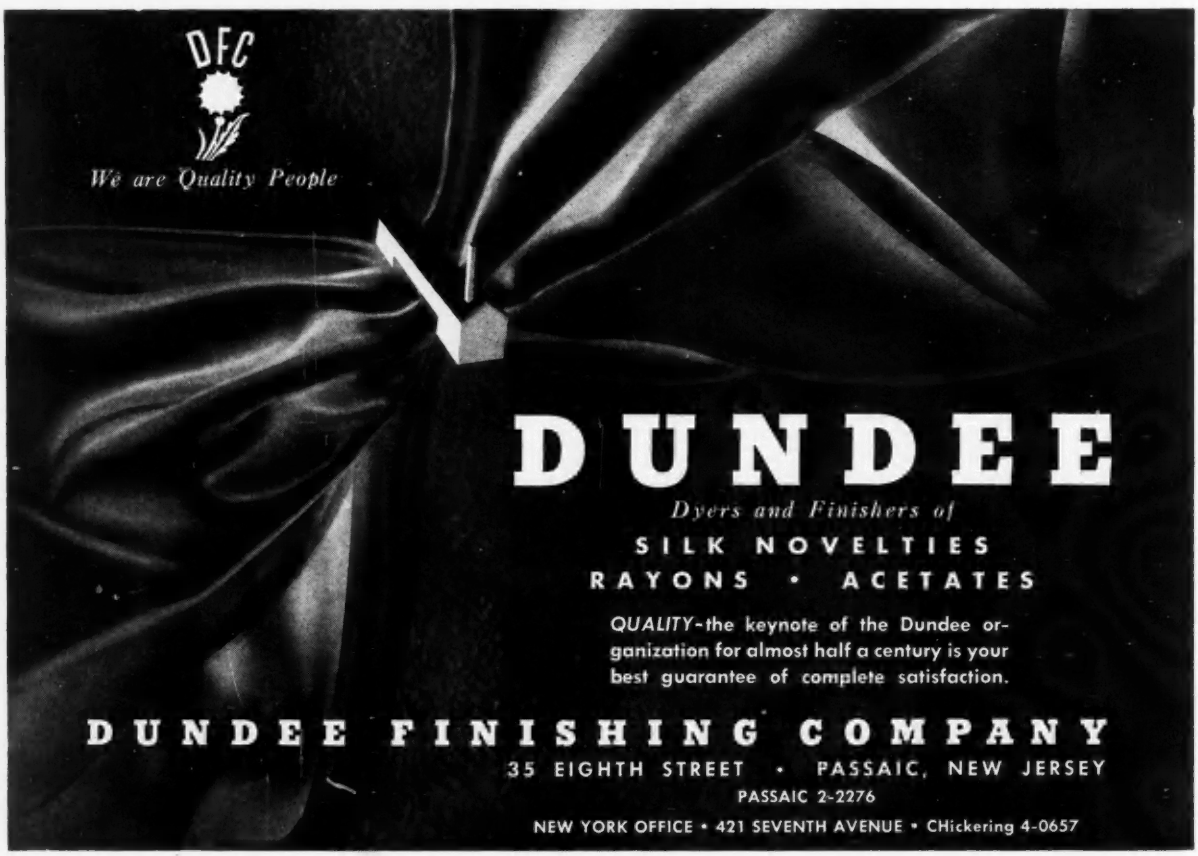
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FOR THE TEXTILE TRADE

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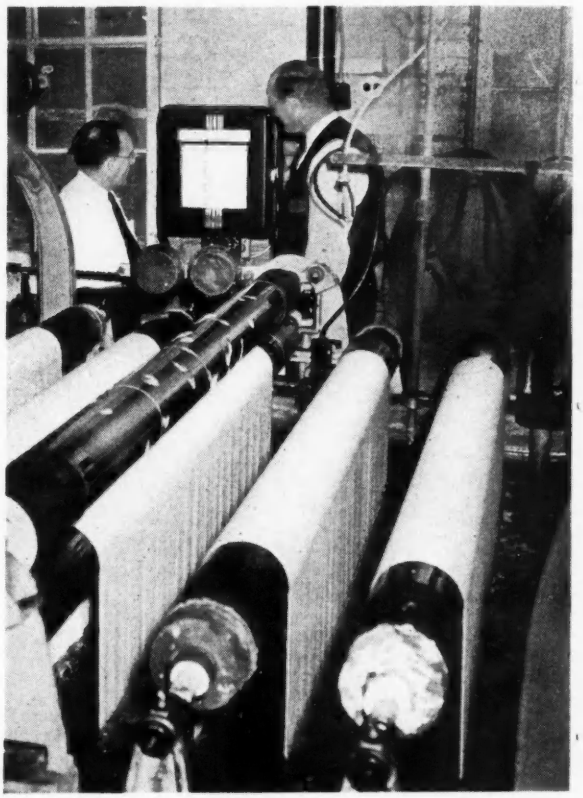

Their Hunter carbonizing range has two acid tanks, instead of the customary one, and a preliminary hot water bath, enabling them to saturate so rapidly that the rate of output for many weights of cloth is limited mainly by the capacity of the dryer and carbonizer.

Proper acid strength at any speed is automatically held by the Micromax Conductivity Controller, at which the foreman and superintendent are looking. This instrument measures the acid strength of the bath electrically and throttles its automatic acid valve to maintain the desired concentration. It saves time and labor, gives more level color and more even shrink — and furnishes an indisputable process record.

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WANTED:

Technical Sales Representative for Southern territory by old established chemical manufacturer. An unusual opportunity for a man having following qualifications: At least five years selling experience, actual textile mill experience preferred but not essential. Must have a knowledge of dyeing and finishing. Territory open Virginia, North and South Carolina. Established business. Car furnished. Only experienced men need apply. Salary commensurate with ability. References required, treated confidential.

Write Box No. 568

WANTED: Chemist-Textile laboratory experience, group leader type-surface active agents. Ph.D. preferred. Good future. Write complete details to Box No. 566.

TEXTILE CHEMIST: Well established manufacturer NYC area seeking textile chemist with extensive knowledge and experience in manufacture and development of textile auxiliaries. Knowledge of dyeing and finishing preferable. Excellent prospects for right man. Write Box No. 420.

POSITION WANTED: Textile Chemist and Engineer, well rounded developmental experience in dyeing and printing. Good general background in textile processing. Familiar with synthetic fibers and plastics. Desires position in product development or technical sales. Write Box No. 571.

POSITION WANTED: A dyer wishes to make contact with a firm that needs an expert color-matcher and dyer to take a responsible position. Capable of taking charge of dyehouse or laboratory. Practical experience with cotton, rayon silk, wool, — fibers, yarns and knitted fabrics. Write Box No. 572.

Prominent textile organization has excellent opportunity for development man with background in dyeing, finishing, and printing of synthetic fibers. Applicants should possess development mentality and be capable of translating ideas from laboratory stage to plant production. Textile Chemist or Chemical Engineer preferred. Write Box No. 578.

WANTED: Dye Chemist—Young Ph.D. or with equivalent experience in dyestuff or textile field, to carry on research and development work on the dyeing of keratin fibers. Knowledge of dyestuffs and dyeing essential, of protein and fibers desirable. Excellent opportunity in the Chicago area. In reply state education, experience and salary expectation. Write Box No. 579.

• CLASSIFIED ADVERTISEMENTS •

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Company, marketing a process and service of real importance to Textile Printers, offers good opportunity to representative who has following in New England, Pennsylvania and territories south. Attractive commissions. Write Box No. 581.

POSITION WANTED: Boss dyer, age 42, with 12 years experience in dyeing full fashioned, half hose, anklets and woolen piece goods, raw and carbonized stock wants position in south. Write Box No. 582.

Technical Service Chemist: B.S. graduate in chemistry with one or two years textile finishing plant experience wanted for textile resin application laboratory of large chemical manufacturer. Northern New Jersey location. Write Box No. 583.

POSITION WANTED: Textile colorist three years experience in all fields of dyeing and matching colors on cotton, wool, rayon and nylon. Head of laboratory. Graduate of Textile H. S. age 24 married. Write Box No. 584.

WANTED: Experienced dyer for large full fashion nylon hosiery manufacturer. Excellent position for right man. Give age, and experience in first letter. Replies held strictly confidential. Write Box No. 585.

Textile Engineer under 35 to represent national association in technical service with cotton textile mills. Practical experience, pleasing personality and aptitude for writing are essential qualifications. Position offers opportunity to develop wide knowledge of textile field. Location: Washington, D. C. Please include full details of education, experience, age, expected salary. Write Box No. 580.

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New England-New York-New Jersey.

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He should have a textile or technical college training and a knowledge of practical textile processing and finishing. Submit resume of training and experience, age and salary required.

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NU-DYE
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FINISHING
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WHICH SHOULD WARRANT YOUR ATTENTION

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*PARAMINE T A: A cation active softener for processing cotton and rayon cloth to obtain a soft, smooth, pleasing finish.

ANTHOMINE: Auxiliary used in all wool dyeing processes to produce a uniform shade and impart a soft pleasing hand to stock, yarn and cloth. Improves exhaustion of dye bath and increases color yield. Very effective for levelling shade of tippy and mixed wools.

PARAPON S A: A highly efficient leveler and softener for dyeing and finishing all types of yarn, cloth and hosiery to produce a uniform dyeing and a soft full hand.

*ARIPEL F S: Finish and gas inhibitor for processing dyed acetate rayon—produces a soft, full feeling finish and prevents gas fading of the color.

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*DIAZONOL A C: For boiling out cotton cloth in pressure or open kiers to produce greater absorbency and cleaner material. Excellent for pre-boiling knitted cloth in preparation for chlorine bleach. Also used with good results for boiling out cotton or rayon cloth on the jig.

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And a complete line of Oils, Chemicals, Softeners and Finishes for Wet Processing All Textile Fibres

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Rub it!
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Made to size . . . it will stay to size . . .

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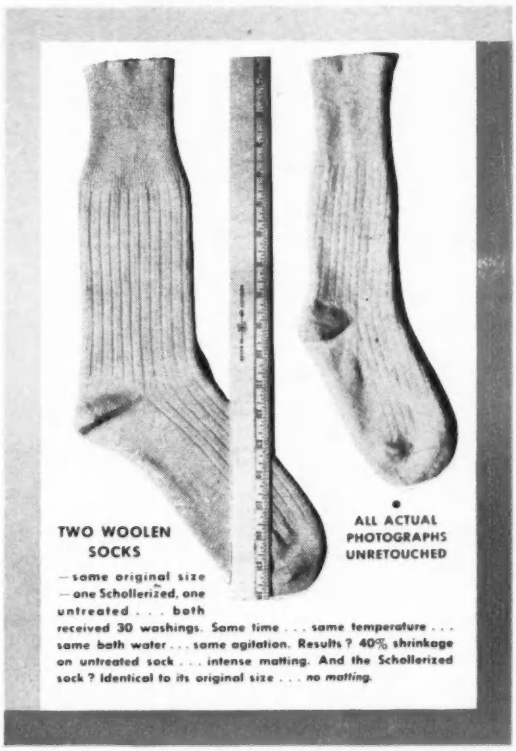

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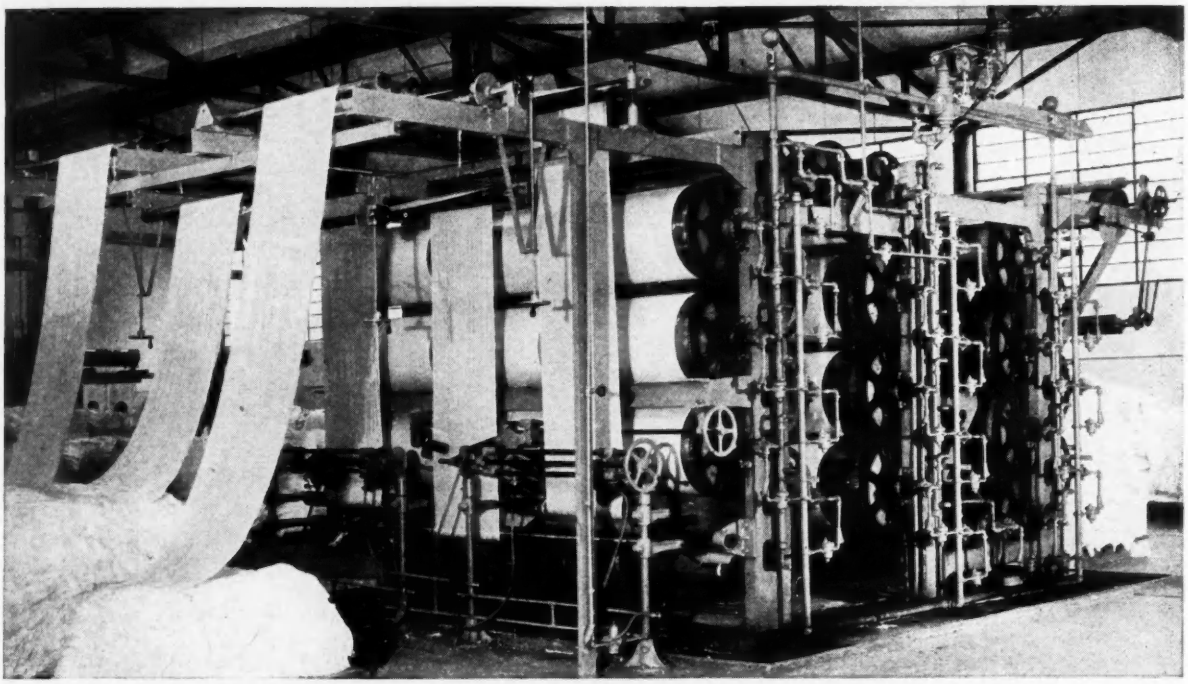

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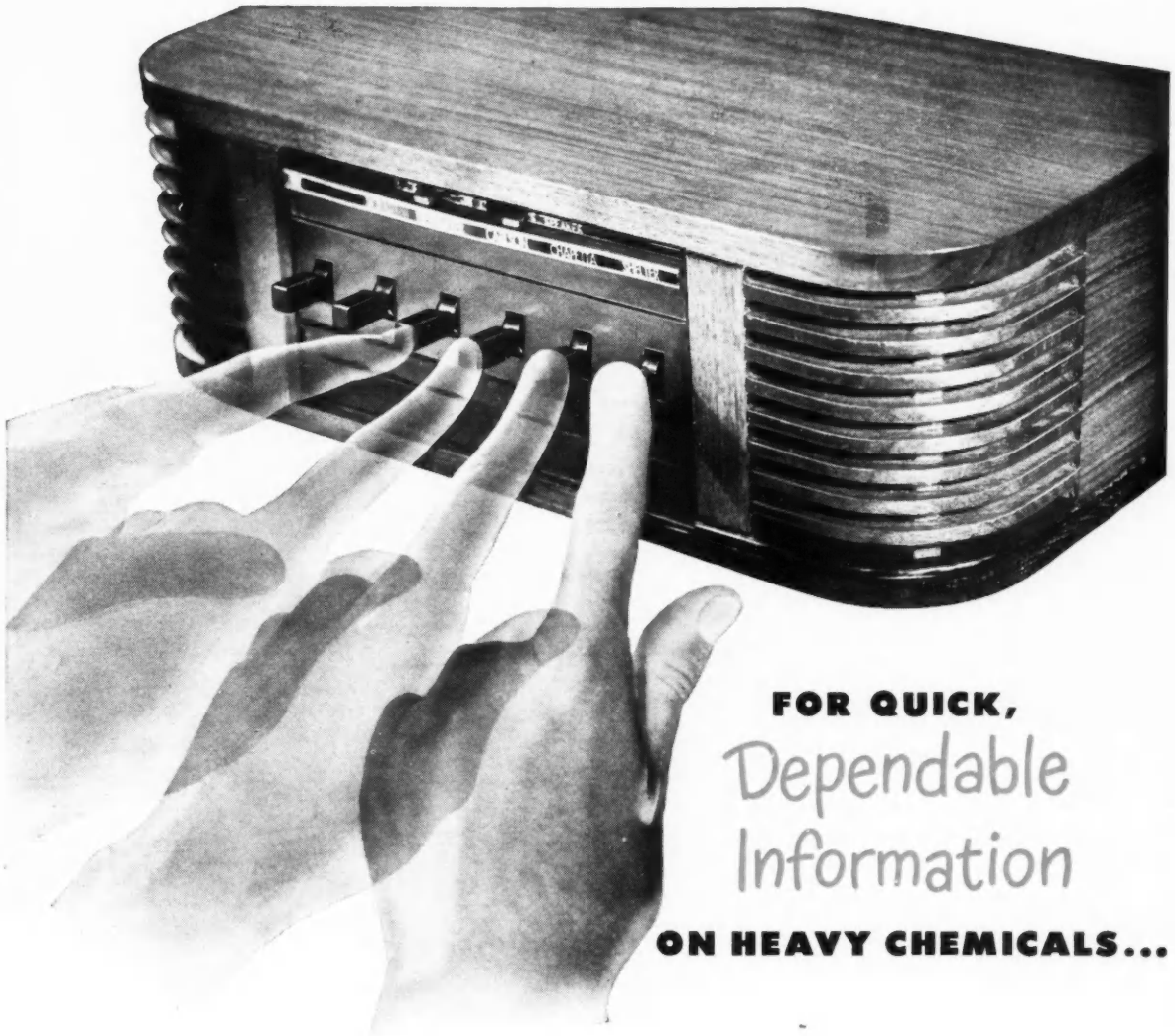

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